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Bulletin of the University of New Hampshire

For information about undergraduate admission to the University, students may contact:
Eugene A. Savage, Director of Admissions
For information about courses and academic records, students and former students should contact:
Leslie C. Turner, Registrar

Volume LXVII, Number 9, April 1976. Bulletin of the University of New Hampshire is published 9 times a year: twice in Aug., and once in Sept., Oct., Nov., Jan., Feb., Mar., and April by UNH Publications Office, Schofield House, Durham, N.H. 03824. Second class postage paid at Durham, N.H. 03824.

The Bulletin of the University of New Hampshire is a periodic publication of UNH. The issues are originated and published for the purpose of disseminating information of a public character relating to the University's programs, services, and activities. Issues published in 1975-76 include: Life at UNH Issue, Division of Continuing Education issues, Financial Aid Issue, Thompson School Issue, Community Report Issue, Summer Session Issue, Graduate School Issue, and Undergraduate Issue.

It is the policy of the University of New Hampshire not to discriminate on the basis of sex, race, color, religion or national origin in its admission and financial aid processes, in accordance with Title VI of the Civil Rights Act of 1964 and Title IX of the Education Amendments of 1972.

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University Calendar 1976-77

Semester I 1976

September 5, Sunday	8 a.m. Residence halls open for new students
September 7, Tuesday	Registration
September 8, Wednesday	8 a.m. Classes begin
September 11, Saturday	Classes hold Friday schedule
September 24, Friday	Last day to drop courses without $10 late drop fee
October 1, Friday	Last day to add courses without $10 late add fee
October 7, Thursday	Last day to carry over 20 credits without surcharge, or for partial tuition refund on withdrawal
October 8, Friday	Last day to opt for Pass/Fail
October 22, Friday	9 a.m. Mid-semester rosters for freshman due
November 3, Wednesday	Mid-semester, last day to drop courses or withdraw without academic liability
November 11, Thursday	Veterans Day, no classes, University holiday
November 22, Monday	Pre-registration for Semester II begins
November 24, Wednesday	Classes hold Thursday schedule 7 p.m. Residence halls close, Thanksgiving
November 28, Sunday	2 p.m. Residence halls open
November 29, Monday	8 a.m. Classes resume
December 17, Friday	Reading Day
December 19, Sunday	Commencement
December 20, Monday	8 a.m. Semester I final exams begin
December 23, Thursday	6 p.m. Final exams end; 8 p.m. Residence halls close

Semester II 1977

January 22, Saturday	8 a.m. Residence halls open
January 23, Sunday	Registration
January 24, Monday	8 a.m. Classes begin
February 4, Friday	Last day to drop courses without $10 late drop fee
February 11, Friday	Last day to add courses without $10 late add fee
February 22, Tuesday	Last day to carry over 20 credits without surcharge, or for partial tuition refund on withdrawal
February 25, Friday	Last day to opt for Pass/Fail
March 11, Friday	9 a.m. Mid-semester rosters for freshman due
March 18, Friday	Mid-semester, last day to drop courses or withdraw without academic liability 7 p.m. Residence halls close, Spring recess
March 27, Sunday	2 p.m. Residence halls open
March 28, Monday	8 a.m. Classes resume
April 11, Monday	8 a.m. Pre-registration for Semester I, 1977-78 begins
May 16-17, Monday-Tuesday	Reading days
May 18, Wednesday	8 a.m. Semester II final exams begin
May 24, Tuesday	Final exams end; 8 p.m. Residence halls close
May 29, Sunday	Commencement

The University reserves the right to modify the Calendar subsequent to printing.

Trustees and Principal Officers

Trustees 1976

His Excellency Meldrim Thomson, Jr. LL.B.
Governor of New Hampshire
ex officio

Howard C. Townsend
Commissioner of Agriculture
ex officio

Newell J. Paire, B.Ed., M.Ed.
Commissioner of Education
ex officio

Bruce R. Poulton, B.S., M.S., Ph.D.
Chancellor of the University System
ex officio

Eugene S. Mills, A.B., M.A., Ph.D.
President of the University
ex officio

Harold E. Hyde, B.S., M.S., Ed.D.
President of Plymouth State College
ex officio

Leo F. Redfern, B.A., M.A., M.P.A., Ph.D.
President of Keene State College
ex officio

Philip S. Dunlap, B.S.
Concord (1969-1978)
Chairman of the Board

Richard A. Morse, A.B., J.D.
Manchester (1971-1977)
Vice Chairman of the Board

Frederick C. Walker, B.S., Ed.M.
Dover (1968-1976)
Secretary of the Board

Margaret R. Ramsay, B.E., M.Ed.
Keene (1971-1979)

David A. Rock
Nashua (1971-1976)

Paul J. Holloway, B.S.
Exeter (1972-1976)

William L. Dunfey, B.A., M.A., D.Sc.
Rye (1972-1976)

Virginia T. Steelman, B.S., M.Ed.
Manchester (1973-1977)

Joseph B. Moriarty
Lee (1973-1977)

Francis E. Robinson, B.A., M.A.
Durham (1974-1978)

Stacey W. Cole
Swanzey (1974-1978)

Frank A. Carter III
Student Member
University of New Hampshire (1974-75)

Hedley G. Pingree, A.B., LL.B.
Goffstown (1975-1979)

Robert H. Foster, B.S.
Dover (1975-1979)

Nathan T. Battles, B.A.
Kingston (1975-1977)

John W. Day, B.Ed., M.Ed., H.D.L. (Hon.)
Keene (1975-1979)

Dorothy P. O'Neil, B.S.
Chesterfield (1975-1979)

James P. Weldon, B.S.
North Hampton (1975-1979)

Principal Officers of Administration

Eugene S. Mills, Ph.D.
President

David W. Ellis, Ph.D.
Vice Provost for Academic Affairs

Allan B. Prince, Ph.D.
Vice Provost for Budget and Administration

Richard F. Stevens, M.Ed.
Vice Provost for Student Affairs

Harry A. Keener, Ph.D.
Dean of the College of Life Sciences and Agriculture; Director of the Agricultural Experiment Station

Jan E. Clee, Ph.D.
Dean of the Whittemore School of Business and Economics

Richard S. Davis, Ph.D.
Dean of the College of Engineering and Physical Sciences

Allan A. Spitz, Ph.D.
Dean of the College of Liberal Arts

Basil J.F. Mott, Ph.D.
Dean of the School of Health Studies

Raymond L. Erickson, Ph.D.
Dean of the Graduate School and Director of Research

Maynard C. Heckel, Ed.D.
Dean of the School of Continuing Studies and Director of the Cooperative Extension Service

Jane E. Newman, M.Ed.
Dean of Students

Edward J. Durnall, Ed.D.
Director of the Division of Continuing Education

Donald E. Vincent, Ph.D.
University Librarian

Andrew T. Mooradian, M.S.
Director of the Department of Intercollegiate Athletics

Eugene A. Savage, M.Ed.
Director of Admissions

Leslie C. Turner, M.Ed.
Registrar

Karen Hogarth, M.S.
Ombudsman

University System of New Hampshire Officers

Bruce R. Poulton, Ph.D.
Chancellor

Norman W. Myers, B.S.
Vice President-Treasurer

Gary W. Wulf, M.S.
Director of System Personnel Services

John B. Hraba, Ph.D.
Director of System Planning and Analysis

W. Arthur Grant, B.A.
Director of System Administrative Services

Edward F. Smith, M.B.A.
Director of System Budgets

For officers of administrative divisions, see page 225.

General Information

Facts About the University

History

The University of New Hampshire, founded in 1866 as the New Hampshire College of Agriculture and the Mechanic Arts, was among the early state institutions of higher education made possible by federal government land grants to establish colleges to serve the sons and daughters of farming and laboring families.

First located in Hanover as part of Dartmouth College, New Hampshire College moved to its present campus in Durham in 1893 after Benjamin Thompson, a prosperous farmer, bequeathed land and money to further the development of the college.

The College prospered in Durham, and in 1923 the State Legislature granted it a new charter as the University of New Hampshire, composed of the Colleges of Agriculture, Liberal Arts, and Technology. The Graduate School was formally added in 1928. The two-year program in agriculture which had been offered since 1895 was formally recognized in 1939 (now the Thompson School of Applied Science). In 1962, the Whittemore School of Business and Economics was established.

In 1963 the state's system of higher education was created when the teachers' colleges at Plymouth and Keene were brought under the same Board of Trustees as the University. In 1969 the State Legislature recognized the extended functions of the College of Agriculture, renaming it the College of Life Sciences and Agriculture; and the School of Health Studies was established as part of the University at Durham. Beginning in 1971, the Division of Continuing Education was authorized to offer Associate in Arts degree programs as an alternative approach to higher education for New Hampshire residents. In 1975 the College of Technology was renamed the College of Engineering and Physical Sciences.

Since 1967, the University has provided a widening range of undergraduate and graduate studies through its program at the Merrimack Valley Branch in Manchester, where development of a permanent campus is under way. In 1972, the School of Continuing Studies was created to coordinate the off-campus, educational programs of the University system institutions and to carry instructional services to communities throughout New Hampshire.

In the 1975-76 academic year, the University had 10,300 students enrolled at Durham. The State Colleges at Plymouth and Keene had a combined enrollment of about 6,000, and more than 3,000 students were enrolled in Merrimack Valley Branch programs. The School of Continuing Studies had more than 1,400 students.

Academic and cultural resources of each campus are amplified through System-shared programs and facilities. Cooperative ventures among the 10 member institutions of the New Hampshire College and University Council combine public and private higher education resources.

Physical Plant

The University campus in Durham covers 156 acres. There are 35 buildings devoted to instruction, research, and administration; 30 residence halls housing about 4,500 men and women; and three modern dining halls. Total University lands—including athletic fields and woodlots—comprise 3,500 acres. In addition to new residence halls and a new dining hall, major construction completed during recent years includes:

University Library, with 712,363 volumes, 5,500 periodicals, more than 6,000 tapes and records, music listening rooms, and a substantial microfilm collection, has been expanded to accommodate up to one million volumes and to provide increased study area.

Whittemore School of Business and Economics occupies a new four-story building containing classrooms, seminar rooms, lecture halls, offices, and sophisticated business and technological equipment.

Parsons Hall, completed in 1970, provides modern facilities for the Department of Chemistry.

Athletics–Physical Education Facility, includes indoor swimming pool, track, and gymnasia. *Snively Arena,* an indoor ice hockey rink, also accommodates convocations and major cultural attractions.

Kendall Hall, a five-story building completed in the spring of 1970, is the home of the Animal Sciences Department with offices, classrooms, and laboratories. The library for the College of Life Sciences and Agriculture and for the Departments of Microbiology and Zoology is located on the first floor.

The New England Center, a cooperative effort by the six state universities of New England to provide outstanding continuing

education programs throughout the region, is located at Durham. Offices for several regionally oriented educational organizations are in its administration center, and its residence-dining-learning center provides modern facilities for adult education conferences and seminars.

Teaching, Service, and Research

The University of New Hampshire is committed to offering excellent educational programs and opportunities for its students. The University's 570 full-time teaching faculty provide a ratio of one full-time faculty member for each 19 students. More than 75 percent of the full-time faculty hold doctoral degrees, and many have earned national and international reputations in their professional fields.

A faculty member's first responsibility is to teaching students. In the tradition of the nation's land-grant colleges, the University also encourages its faculty to contribute to the growth of human knowledge through scholarly research and service to the community beyond the campus.

Accreditation

The New England Association of Schools and Colleges is the major accrediting body for the University of New Hampshire, and the University is a member in good standing of that Association. Specialized programs of study offered by the University are also accredited by various professional organizations.

Admissions Procedure

General Information

The admissions policy of the University is designed to provide for the admission of those students whose personal records, achievement, aptitude, and motivation demonstrate that they have the qualifications for carrying the desired program satisfactorily. Factors of sex, race, religion, color, and national origin do not enter into the admissions process.

Eligibility for Degree Candidacy

An applicant who meets the appropriate requirements for admission may become a candidate for any undergraduate degree offered by the University. However, applicants having received one degree from any institution will not be admitted into a program of study that awards the same degree (B.A. History, B.A. Zoology). Applicants may, however, be admitted into a program of study awarding a different degree (B.A. History, B.S. Biology, or B.A. History, A.A.S. Business Management).

Bachelor Degree Candidacy

The University accepts New Hampshire residents for bachelor degree programs on the basis of academic achievement, secondary school course selections, rank-in-class, school recommendations, and Scholastic Aptitude Test results. Consideration is also given to such related factors as personal character, leadership, initiative, special aptitudes and talents. All candidates must meet the minimum secondary school program requirements as outlined in the accompanying chart.

The number of out-of-state students admitted to bachelor degree programs each year is limited and selection is made primarily on the basis of superior academic achievement in secondary school. Such traits as good character, leadership, initiative, and creative ability are considered. Under the present Selective Admissions Program, out-of-state baccalaureate degree candidates must apply to one of the University's five schools and colleges and will be considered for admission in competition with other out-of-state candidates for the same division. Competition for admission to the different undergraduate areas may vary.

Students should realize that it may not be possible to transfer to another undergraduate school or college of the University after enrollment. The student who wishes to change to another undergraduate division after enrollment must secure permission from the dean of that college and the chairperson of the program s/he wishes to enter. Candidates should also realize that, although they may qualify for general admission, the University is not able to guarantee that space will be available in all program areas.

Associate Degree Candidacy

The University accepts candidates for Associate in Applied Science and Associate in Arts degree programs who have demonstrated ability and motivation for learning through secondary-school achievement, work experience, and/or military service.

Both New Hampshire residents and out-of-state students may be considered for admission to Associate in Applied Science degree programs offered by the University's Thompson School of Applied Science. Students approved for admission to the Thompson School will be eligible for University residence hall accommodations. Two of the programs offered by the Thompson School, the Forest Technology and the Civil Technology programs, require that candidates present a minumum of two years in college preparatory mathematics.

The University offers an Associate in Arts degree program through the Division of Continuing Education. This program is available only to commuting New Hampshire residents; however, this rule may be waived if the applicant is a full-time employee of a New Hampshire business. (See also Associate in Arts chapter.)

Secondary School Course Requirements for Bachelor Degree Candidacy

All students who present the secondary course requirements outlined in the "Minimum Secondary Program" are eligible to receive consideration for admission to the University's bachelor degree programs. The University encourages students to develop a balance between courses outlined in "Recommended Secondary Program" and their own interests, which may lead them to choose electives outside the traditional academic course areas.

Special Student Status

The University offers the Special Student classification for persons who wish to participate in University coursework without entering degree programs.Special (non-matriculated) students reg-

Minimum Secondary Program

	Life Sciences & Agriculture	Liberal Arts	Engineering & Physical Sciences	Whittemore	Health Studies
English	4 units	4 units	4 units	4 units	4 units
Language	0 units	2 units*	0 units	2 units*	0 units
Mathematics	2 units	2 units	3 units†	2 units	2 units
Laboratory Sciences‡	1 unit	1 unit	2 units**	1 unit	1 unit§
Social Studies	2 units	2 units	2 units	2 units	2 units

Recommended Secondary Program

	Life Sciences & Agriculture	Liberal Arts	Engineering & Physical Sciences	Whittemore	Health Studies
English	4 units	4 units	4 units	4 units	4 units
Language	2 units*	3 units*	3 units*	3 units*	3 units*
Mathematics	3 units	3 units	4 units†	3 units	3 units
Laboratory Sciences‡	3 units	3 units	3 units**	3 units	3 units§
Social Studies	3 units	3 units	2 units	3 units	3 units

*of a single foreign language †college preparatory math including trigonometry ‡excluding "General Science" **must include Physics or Chemistry §should include Biology

ister for course work through the University's Division of Continuing Education and are usually restricted to part-time study (maximum of 11 semester hours) unless permission is granted by the Admissions Office. Special students have full access to the academic counseling services of the Division and should realize that their continuing participation in University course work is predicated upon satisfactory achievement.

Admission Test Requirements

All candidates for admission to bachelor degree programs are required to submit the results of a College Entrance Examination Board Scholastic Aptitude Test. English Composition test results may be submitted by candidates who wish to qualify for exemption from the University's Freshman English course requirement. In order to be exempted, a student must achieve a combined score of 1200 or better on the verbal portion of the Scholastic Aptitude Test and the English Composition Achievement Test. For those students applying to programs which lead to the Bachelor of Arts degree, a score of 500 or better on a Foreign Language Achievement Test may be used as a means of satisfying the degree's foreign language requirement. Other achievement tests are strongly recommended for candidates to the College of Engineering and Physical Sciences, the College of Life Sciences and Agriculture, and the School of Health Studies in the areas generally related to the student's prospective major. It is possible for students to submit the results of these examinations as late as May of their senior year.

Candidates applying for the Arts major, studio option, or the Bachelor of Fine Arts program are required to submit a portfolio. There is no portfolio requirement for those entering the Art History option of the Arts major. Candidates applying for programs in the Department of Music must make arrangements with the chairperson of the Music Department for an audition. Chairpersons of both the Art and Music Departments may be reached at the Paul Creative Arts Center.

Except for Early Decision candidates, applications should be submitted only after the first marking period grades are available and for non-resident applicants before February 15. New Hampshire applicants must submit their applications by March 1. Applications received from New Hampshire residents after March 1 may be considered only as vacancies occur. A non-refundable application fee, $10 for residents of New Hampshire and $20 for nonresidents, must accompany the application.

Interviews

Interviews are not required as part of the admission process. However, candidates are most welcome to contact the Admissions Office in order to arrange interviews with UNH student Admissions Representatives who will be pleased to help them become better acquainted with the University. Also group information sessions are frequently held on Saturday mornings. These group sessions are opportunities for an exchange of information and are followed by guided tours of the campus. Applicants may contact the Admissions Office for further information. Students are encouraged to visit the campus, and information about regularly scheduled tours is available from the Admissions Office.

Early Decision

The University is willing to give secondary school seniors who desire fall enrollment consideration for admission under an Early Decision program designed for well qualified students who have made the University their first-choice school. Applicants must submit a regular application, high school record, junior year Scholastic Aptitude Test, and a statement countersigned by the secondary school counselor which indicates that the University of New Hampshire is the first-choice college and that other applications will be withdrawn if the candidate is admitted under Early Decision. Candidates for admission under the Early Decision program must file their applications and all supporting credentials between September 15 and November 15 and will be notified of the decision within two weeks of the receipt of application materials. Prospective students should realize that enrollment pressures in some degree areas may preclude inclusion in the Early Decision program; historically the Early Decision plan has not been available for out-of-state Nursing, Medical Technology, Occupational Therapy, and Wildlife Management candidates.

Advanced Standing

The University will recognize unusual secondary school work by means of advanced placement and credit for those who have taken enriched or accelerated courses before entering college. Applicants qualify for such credit by satisfactory achievement on University-approved placement examinations including the College Board Advanced Placement Tests or through the College Level

Examination Program (CLEP). Further information may be obtained from the Admissions Office.

Readmission

An undergraduate student who withdraws or is suspended or dismissed from the University thereby terminates degree candidacy. Students who have withdrawn or been suspended must apply for readmission and these applications are normally acted upon favorably provided that the suspended student has remained away from school for at least a semester. Students who have been dismissed must remain away from school for a period of three years before seeking readmission. Students applying for readmission should realize that it may not be possible to enroll in certain programs which have established enrollment limitations, and no assurance can be offered that University housing will be available.

Transfer Students

The University will consider qualified candidates from approved institutions. Transfer credit is awarded for courses which have been completed with a grade above the lowest passing grade, provided those courses are comparable to courses offered at the University of New Hampshire.

The University is pleased to encourage the competent transfer applicant who has valid and legitimate reasons for desiring transfer to the University of New Hampshire; however, it cannot encourage the applicant with a history of academic or personal difficulty. University admissions policy considers students for transfer with satisfactory academic and personal records. In the event of personal or academic difficulty, a student is usually better advised to return to the former college after an appropriate period and clear the record before attempting to transfer.

A student enrolled in one of the University's associate degree programs who desires admission to a baccalaureate degree program at the University must apply as a transfer student through the Admissions Office. A recommendation from the student's associate degree advisor is also required.

Students desiring to transfer for the fall semester must complete application procedures before April 1; for spring semester, by November 15th.

New England Regional Student Program

The University participates in the New England Regional Student Program of the New England Board of Higher Education in which each state university in New England offers a number of regional curricula at the undergraduate level to students from other New England states. Under this program a student receives preferential admissions consideration and, if admitted, pays in-state tuition. The student must indicate on the application the intention to apply for this reduced tuition. Information about the curricula included in this program may be obtained from the New England Board of Higher Education, 40 Grove St., Wellesley, Mass. 02181.

Rules Governing Tuition Rates

Basic Rule: All students attending any division of the University of New Hampshire in any capacity shall be charged tuition at a rate to be determined by their domicile. Those domiciled within the state of New Hampshire shall pay the in-state rate. Those domiciled elsewhere shall pay the out-of-state rate.

A student is classified as a resident or nonresident for tuition purposes at the time of admission to the University. The decision, made by the director of admissions, is based upon information furnished by the student's application and any other relevant information.

All applicants living in New Hampshire are required to submit a notarized statement to the effect that their parents have been legally domiciled in New Hampshire continuously for a period of at least twelve months immediately prior to registering for the term for which the student is claiming in-state status. Students admitted from states other than New Hampshire or from foreign countries are considered nonresident throughout their entire attendance at the University unless they shall have acquired bona fide domicile in New Hampshire.

If the student maintains his/her residency apart from that of his/her parents, he/she must clearly establish that his/her residence in New Hampshire is for some purpose other than the temporary one of obtaining an education at the University. To qualify for in-state status the student must have been legally domiciled in New Hampshire continuously for a period of at least twelve months prior to registering for the term for which in-state status is claimed.

The burden of proof in all cases is upon the applicant. In all cases, the University reserves the right to make the final decision as to resident status for tuition purposes.

The University Rules Governing Tuition Rates are fully set forth on the application for admission, and all students are bound by them.

Division of Student Affairs

The Division of Student Affairs provides a wide range of student services and programs which supplement the academic programs of the University.

Division functional areas include: the Vice Provost for Student Affairs; the Dean of Students; Residential Life, which includes Dining Services and residence halls; Financial Aid; Recreation and Student Activities; and Counseling and Health Services, consisting of the Health Service, Counseling and Testing, and Career Planning and Placement Service.

Dean of Students Office

The Dean of Students Office has major responsibility for the quality of student life on campus. The staff has a working knowledge of the entire University (policies, procedures, and people) and interacts regularly with students, staff, faculty, trustees, and other persons who are interested or involved with what is happening at the University.

Within the Dean of Students Office there are seven specific areas of responsibility: judicial affairs, new student programs, community and student development, research and planning, international student affairs, veterans affairs, and non-academic University policies and procedures. Students and others are encouraged to contact the Dean of Students Office whenever they have a question, concern, or problem involving Universtiy life.

Residential Life and Dining Services

The University has 30 undergraduate residence halls grouped in three geographic areas on campus with a dining hall located in each area.

Information about and applications for room and board are sent to eligible new students soon after notices of admission.

The University reserves the right to adjust room and board charges and policies when necessary; however, such adjustments will be announced as far in advance as possible. Additional information about residence halls and dining service is available through the Office of Residential Life.

Residence Halls

Students are not required to live on campus. Undergraduate University housing is limited to full-time degree candidates; Associate in Arts degree and Division of Continuing Education students are not eligible for on-campus housing.

Most rooms are designed for double occupancy, but there are some single and triple rooms available.

The highest priority for residence hall housing is given to entering freshmen. Transfer and readmitted students are accommodated only to the extent space is available. To be considered for space in a residence hall, entering students must follow the established application procedures. Students assigned to on-campus housing sign a room contract for the entire academic year.

University housing is not guaranteed over the full four-year undergraduate period.

Dining

University policy requires that students living in residence halls board in University dining halls.

Any full-time student who does not live in a residence hall may purchase a meal ticket if dining hall capacities permit, or they may purchase meals at the Memorial Union cafeteria.

Students who have special diets generally find it possible to select these diets from the choices offered in the dining halls. However, students whose diets, because of religion or health, require an unusual menu should inquire with Dining Services as to its availability. Any request for exceptions to the board policy because of dietary restrictions must be made prior to the beginning of the semester.

Recreation and Student Activities

The Office of Recreation and Student Activities in the Memorial Union serves as the center for intramurals, club sports, recreational activities, cultural events, student organizations, and related activities. It provides a wide range of services and programs for the entire University community.

Memorial Union

Services in the Memorial Union include the University Information Center and Ticket Office, the Union store, a crafts center, a scheduling office for room and facility reservations, and a food service operation consisting of a cafeteria, pub, and catering service. The games area on the lower level of the building has candlepin bowling lanes, pool and billiard tables, pin ball machines, and table tennis tables.

Recreation

Students participate in a variety of recreational activities, in most instances without additional charge. To accommodate the diverse interests and changing needs of the campus community, recreational activities are organized in three interrelated programs: men's, women's, and co-recreational intramural sports; club sports; and leisure-time activities and services.

Men's intramurals range from golf, tennis, and touch football in the fall to ice hockey and basketball in the winter, and hall hockey and bowling in the spring. A partial list of women's intramurals includes powder puff football, basketball, volleyball, bowling, jogging marathon, and tennis. Co-recreational activities include volleyball, water polo, bowling, basketball, and softball.

The club sports program offers instruction and competition with other college clubs in New England. Rugby, sailing, women's ice hockey, and ping pong are among the 24 club sports in the program.

Informal participation in swimming, exercising and jogging, tennis, ice skating, and field sports is available at Snively Arena, the Field House, and the University's Outdoor Recreation Area at Mendums Pond.

Student Activities

Student activities offer traditional programming and new and creative programming ideas ranging from lectures, concerts, films, and educational seminars to special events like Winter Carnival, the Memorial Union open house, and spring dances. Students participate in approximately seventy other recognized clubs, each with special interests ranging from politics to service and from career to leisure time activities.

The Student Activities Tax provides funds for *The New Hampshire*, the bi-weekly student newspaper; WUNH-FM, the student radio station; Student Video Tape Organization; Student Government; Student Press; and the Memorial Union Student Organization (MUSO) and the Student Committee on Popular Entertainment (SCOPE).

Cultural Programs

With two theaters and two art galleries in the Paul Creative Arts Center, the University is a major cultural resource for the entire state. The Sidore Lecture Series presents provocative, well-known speakers and experimental programs throughout the year. The University's celebrity series brings leading concert artists and a colorful array of professional talent to present a variety of programs centering on human communications whether in song, dance, speech, or mime.

University students perform frequently in concerts, recitals, and theatrical productions. Open to all undergraduates, these programs originate in the Music and Speech and Drama departments. Sculpture, crafts, painting, and photography fill the University Art Galleries with exhibits of the work of local and international artists as well as students and faculty.

Counseling and Health Services

The Counseling and Health Services staff is concerned with the total well-being of students, offering health care, counseling services, testing, and career planning and placement.

Health Service

The University Health Service in Hood House provides out- and in-patient health care, laboratory tests, x-rays, limited mental-health care, and routine medications. For serious medical problems, students are generally referred to specialists and/or a local hospital. An emergency ambulance service is available at all times.

During the regular academic year, Hood House is staffed by full-time physicians, nurses, and part-time consultants. Appointments with physicians may be made upon request. An appointment is not necessary for medical problems requiring immediate attention and these patients will be treated through the out-patient clinic.

An optional group health insurance plan may be purchased through the University Business Office. All undergraduate students paying full fees are eligible to purchase this insurance and to use it at Hood House.

Health Record Requirement

In order to provide effective health service to students, the University requires that students who have been formally accepted for bachelor or associate degree candidacy and register for nine or more semester credit hours must have complete medical records on file with the University Health Service. These records consist of two University health forms: one a health history statement and the other a record of a recent physical examination conducted by a regular-licensed physician. Students wishing exemption from this requirement on religious grounds must make a written request to the Medical Director of the University Health Service. These two forms will be forwarded to the student following notice of admission and it will be the student's responsibility to return the completed forms to the University Health Service prior to the beginning of classes. Any student failing to submit the completed forms will not be allowed to register for classes in subsequent semesters.

Counseling and Testing Center

The Counseling and Testing Center offers students, without charge, professional assistance in meeting the variety of personal, educational, and vocational problems. Services include individual and group counseling, vocational testing, and information on national testing programs such as the Graduate Record Examination. Individual clinical testing is available when indicated.

The staff is committed to the welfare and development of UNH students. The Center sponsors a variety of student oriented activities, e.g. personal skills groups on such topics as communication, values clarification, and life planning. The staff is available for consultation with faculty, administrative staff, and parents on matters relating to the welfare of students.

All information about students' visits to the Counseling and Testing Center is confidential and cannot be released to anyone without the permission of the student.

Career Planning and Placement Service

The Career Planning and Placement Service assists students in planning for professional careers following completion of their undergraduate work. The assistance available to students includes: an on-campus interview program, which brings recruiting personnel to the campus between November and April; a library of information on employers and career opportunities; vocational counseling; and aid in finding summer employment.

The Service will update student's records and provide assistance to alumni.

College Council Placement Office The Council Placement Office is a student service program funded by the New Hampshire College and University Council, of which the University is a member. Students are welcome to take advantage of this supplementary resource. The CCPO may be contacted directly at its Manchester, New Hampshire, office or through the University's placement office.

Financial Aid

The University Financial Aid Office assists promising students who are unable to meet their educational expenses entirely from their own family resources. Aid is available in the form of grants and scholarships, loans, and part-time employment. A Financial Aid Bulletin gives specific information.

In many communities, scholarships and loans are available locally. School principals and guidance counselors have information about these sources of assistance which are available both to high school seniors and adult students.

Before an applicant may be considered for assistance through the University, two forms must be submitted:the UNH Application for Financial Aid and the Parents' Confidential Statement, or, in the case of the adult student, the Student's Financial Statement. New Hampshire applicants may obtain these forms from their high school or from the UNH Financial Aid Office. Nonresidents and transfer students may obtain the UNH application form from the Financial Aid Office and the Parents' Confiden-

tial Statement/Student's Financial Statement from the Financial Aid Office or local high school. Upperclass applicants may obtain both forms from the Financial Aid Office.

Students must meet the following deadlines and should not wait until being admitted to the University before applying for financial aid:

Incoming Freshmen—January 15
Transfer Students—May 1
Upperclass Students—February 15
Readmitted Students—May 1

Grants and Scholarships

Admitted degree candidates, who will attend the University on a full-or part-time basis, may be considered for an in-state tuition grant and University scholarships. Non-residents are eligible for similar assistance. The basic consideration is financial need, although some scholarships are awarded on the basis of scholastic attainment, participation in extracurricular activities, or meeting specific requirements of a donor.

The University participates in the federally-sponsored Supplemental Educational Opportunity Grant Program designed to assist students of exceptional need, who are admitted degree candidates attending on at least a half-time basis.

Basic Educational Opportunity Grant Program

Students are eligible to apply directly to the federal government for a Basic Educational Opportunity Grant. Applications for this program are available in the Financial Aid Office or from high school guidance counselors. Basic grant recipients must re-apply each year for a grant.

Loan Programs

Three loan funds are administered by the University: UNH Loan Fund, National Direct, and Nursing Student Loans. Admitted degree candidates who will attend the University on a full- or part-time basis, may be considered for these loans. Nursing Loans are available only to full-time students under federal law. Financial need must be clearly demonstrated and loans may be used only for educational expenses.

Many states now have higher education loan plans established by the Higher Education Act of 1965. Contact your local bank or other lender for information on these loans.

Part-time Employment

The College Work-Study Program, both academic year and summer, assists students who are determined by the Financial Aid Office to be in need of financial assistance for their educational expenses. Admitted degree candidates attending on at least a half-time basis are eligible for consideration.

Students who do not qualify for the College Work-Study Program may find part-time employment on or near campus.

Non-degree Candidates (Special Students)

Students who have not been admitted to degree programs but who are taking courses on a full- or part-time basis may apply to the Division of Continuing Education for course-charge grants and may also apply for higher educations loans through banks or other lenders as above.

Fees and Expenses

The cost for the freshman year at the University averages about $2,900 for a resident of New Hampshire and about $4,600 for a non-resident.

All University tuition bills, including those for room and board in University buildings, are due and payable on or before registration day of each semester.

Tuition is $900 ($2,600 for non-residents) per academic year. Any undergraduate student registering for twelve credits or more per semester pays the full tuition.

Any combination of courses taken at the University (Durham Campus), Merrimack Valley Branch, and Division of Continuing Education totaling twelve credits or more requires full tuition pay-

ment. Any student registering separately at the University (Durham Campus), Merrimack Valley Branch, and Division of Continuing Education and who pays the per-credit-hour charge at the University (Durham Campus) or Merrimack Valley Branch or the course charge at the Division of Continuing Education will be subsequently billed, if any combination totals twelve credits or more, an additional amount necessary to meet the full tuition charge.

Students are permitted to enroll for more than 20 credits only with the approval of their College dean. After 30 days of the semester have passed students carrying more than 20 credits will be billed a per-credit fee of $30 for each credit above 20 for a resident student and $80 for a non-resident student. (No refund will be made if the student subsequently drops a course bringing him to 20 or less credits). A resident undergraduate student registering for fewer than twelve credits pays $30 per credit hour, plus a registration fee of $5 per semester. A non-resident undergraduate student registering for fewer than twelve credits pays $80 per credit hour, plus a registration fee of $10 per semester. The minimum charge for any recorded course is $30 for residents and $80 for non-residents.

All students who are admitted to the University must make an advance deposit of $50 for residents and $100 for non-residents. This deposit will be credited on the student's tuition bill. In case a student decides not to attend the University after making this deposit, it will automatically be forfeited.

Three-fourths of tuition charges will be refunded to a student withdrawing within one week of registration; one-half after one week and within thirty days; and none thereafter. (See University Calendar, page 3.) A $10 fee must be paid by all students dropping courses after the first two weeks of classes. The $10 fee will not be charged to students changing to a reduced load or students withdrawing; and in both of these cases, the regular tuition rebate policy will apply. A $10 fee will also be assessed for courses added after the three-week add period. The occasional student who registers very late (after the add period) will be assessed the $10 fee for each course which comprises the late registration. A change of section (within the same course is accomplished by a "drop" of one section and an "add" of another section. The fee will not be assessed for the add portion of a late section change. The $10 drop fee will still apply for the drop portion of a late section change.

There are no refunds of the fees which are charged. (This includes the Memorial Union Fee, Student Services fee, Recreation fee and activity tax as well as any special fees.)

A student applying for a room assignment on-campus must include a $50 prepayment fee with the application. Written notification from the student of cancellation of room will, if received prior to July 1, result in a rebate of the $50 prepayment fee minus a $10 cancellation charge. Written notification from the student of cancellation of room received after July 1 but prior to August 15 will result in no rebate of prepayment fee, though room rent-if already paid-will be fully refunded. Written notification from the student of cancellation of room received after August 15 and prior to closing Registration Day will result in the rebate of ¾ of the full semester room rent. Written notification from an enrolled student of cancellation of room after Registration Day and within 30 days from Registration Day will result in the rebate of ½ of the full semester room rent and none thereafter.

Generally there will be no meal-ticket refund except for illness, but a student who withdraws is entitled to a prorated rebate based upon meals remaining from withdrawal-date less two weeks.

Refundable deposits may be required to cover locker keys or loss or breakage in certain departments. A charge will be made for individual lessons in music, as noted in the description of Applied Music courses. A charge will be made for riding lessons and SCUBA, as noted in the sections on Physical Education and Animal Science and for field trips of the Thompson School, Forestry, and Home Economics.

Books and classroom supplies cost approximately $150. These may be purchased at the University Bookstore.

Fees (1975-76) are: Memorial Union fee, $35; recreation / physical education fee, $30; a student service fee, $10; and a student activity tax of $18.90 which includes a subscription to the undergraduate newspaper and yearbook, and membership in Stu-

dent Union, Student Government, and class activities. These fees cover the academic year. Degree candidates registered for less than twelve credits are charged the foregoing mandatory fees on a pro-rata basis.

An optional student season-athletic ticket may be purchased for $20. Optional student insurance for $30 is available to full-time degree candidates. Participants in intercollegiate athletics are required to take the student health insurance.

Housing charges average $650 per academic year.

Personal expenses average $350. These will vary with the needs of the individual student, and include clothing, laundry, recreation, incidentals, and travel.

	Resident	Non-resident
Tuition	$ 900.00	$2,600.00
Room (average)	650.00	650.00
Board (19 meals wk.)	710.00	710.00
Activity tax	18.90	18.90
Recreation / physical education fee	30.00	30.00
Memorial Union fee	35.00	35.00
Student Services fee	10.00	10.00
Books, class supplies	150.00	150.00
Total	2,503.90	4,203.90
Personal expenses	$350.00	$350.00
Athletic admissions ticket (optional)	20.00	20.00
Health insurance (optional)	30.00	30.00

All University bills, including those for room and board in University buildings, are due and payable in full on or before registration day for each semester.

Parents and students who wish to make periodic payments should consult their local banks or other financial institutions which provide programs for budgeting educational expenses.

The University reserves the right to adjust charges for such items as tuition, fees, board, and room rent from time to time. Such charges will be announced as far in advance as feasible.

Reserve Officers Training Corps Programs

The Army and Air Force offer programs leading to a commission as a second lieutenant in their respective services. Students enrolled in either ROTC program may pursue any University curriculum which leads to a baccalaureate or higher degree. The Army and Air Force programs accept both men and women.

Two- and four-year programs are available. The four-year program is open to freshmen and to transfer students who began ROTC at another institution. In addition to on-campus ROTC course requirements, students must attend an officer preparatory training session for a part of one summer.

Two-year ROTC programs are open to students who have two academic years of study remaining at the University. Applicants for the two-year programs must attend a six-week training session during the summer immediately preceding their entry into ROTC.

ROTC scholarships are offered on a competitive basis by both the Army and the Air Force. Entering freshmen may complete for four-year scholarships during the last year of high school. Students, who are enrolled in a four-year ROTC program, and two-year program applicants compete for scholarships covering their remaining academic years. Scholarships pay full tuition, all mandatory University fees, and required textbooks for all courses. In addition, all scholarship recipients receive a tax-free $100 per month subsistence allowance. Non-scholarship students in the last two years of an ROTC program also receive the tax-free $100-per-month subsistence allowance.

Students in either Army or Air Force ROTC who are qualified for pilot training are provided civilian flight instruction.

More specific information about ROTC programs may be obtained by contacting the Professor of Military Service (Army ROTC) or the Professor of Aerospace Studies (Air Force ROTC).

University Academic Requirements

A student is held responsible for all work required for graduation and for the scheduling of all the necessary courses.

General Education Requirements

In addition to the particular requirements for specific degrees, the University requires that every candidate for a bachelor's degree must successfully obtain a passing grade in a minimum of 128 credits; must attain a cumulative grade-point average of at least 2.0 for all courses taken at the University in which a grade is given; and must successfully meet the following general education requirements. (See below and college sections for specific degree requirements.)

The specific courses that satisfy Group I and Group II of the General Education requirements below are currently under review. The list will be available by Registration Day, Semester I 1976.

Group I Four courses (each of which must carry at least three credits) from among the biological sciences, physical sciences, and mathematics.

Group II Six courses (each of which must carry at least three credits) from the arts, humanities, and social sciences.

Group III Six courses, one of which must be freshman English unless specifically exempted by the English Department, and each of which must carry at least three credits, from all courses offered by the University including those in Groups I and II.

The University, College, or department may prescribe up to eight of the sixteen courses used to satisfy the general education requirements. A minimum of eight courses is to be freely elected by the student. **Courses taken to satisfy general education requirements may not be in the student's declared major.**

A University freshman English course in reading and composition is required of all undergraduates unless specifically exempted by the English Department on the basis of a combined score of 1200 or better on the CEEB SAT-Verbal, and English Achievement exams. The freshman English course may not be used to satisfy the arts and humanities requirement in general education.

Grades and Honors

Grades: An instructor may assign grades as listed below. The intermediate grades are designated by adding a plus or minus to the letter grade. Grade points assigned to plus grades are 0.33 higher than to the letter grade without the plus; grade points assigned to minus grades are 0.33 lower than those assigned to the letter grade without the minus.

A (excellent): academic achievement of outstanding quality

A-: Intermediate Grade

B+: Intermediate Grade

B (good): academic achievement of high quality

B-: Intermediate Grade

C+: Intermediate Grade

C (satisfactory): academic achievement of a quality acceptable in satisfying the minimum requirements for graduation

C-: Intermediate Grade

D+: Intermediate Grade

D (unsatisfactory): academic performance below the minimum level established as a prerequisite for graduation, but not so deficient as to demand repetition of the course, unless such repetition of the course is essential for demonstration of competence in the major field

D-: Intermediate Grade

F (failure): academic performance so deficient in quality as to be unacceptable for academic credit

Cr (Credit): given in specific courses designated as no letter grades (Cr/F)

P: a passing grade in a course taken under the pass/fail option

IC: grade reports designate incomplete course work with the notation "IC." "IA" indicates incomplete in a continuing course or thesis. Where appropriate, the grade earned will replace "IA" assigned in previous semesters. "IX" indicates grade not reported.

Grade points per semester hour shall be assigned as follows: A, 4; A-, 3.67; B+, 3.33; B, 3; B-, 2.67; C+, 2.33; C, 2; C-, 1.67; D+, 1.33; D, 1; D-, .67; F, 0.

Honors: A student will be listed for honors with a cumulative and semester average of at least 3.0 regardless of the number of

gradable credits; or a semester average of 3.0 with twelve or more hours of courses carried for letter grades. These categories will be used: 3.0 to 3.4, Honors; 3.5 and 3.6, High Honors; 3.7 to 4.0, Highest Honors. Seniors who have earned honors for their entire college work will be graduated with honors earned.

Pass-Fail: While earning a bachelor's degree, the pass-fail option for grading may be carried in a maximum of four courses outside the courses required in the student's declared major upon election by the undergraduate student. For B.A., B.F.A., and B.M. candidates, the pass-fail option is not permitted in courses which are used to meet the Group I requirement, The Group II requirement, the foreign language requirement, or in English 401. The faculty will not be aware of which students are taking courses pass-fail. All grades will be recorded on the grade roster as A, B, C, D, F, or intermediate grades. The Pass/Fail marks will be placed on the student's transcript and grade reports by the Registrar's Office. The course will not be included in the grade-point calculation, but the Pass or Fail will be recorded, and in the case of a "Pass" the course credits will be counted toward degree requirements. The Pass-Fail option may not be available for courses taken for a minor. Consult the appropriate college for information.

Students may not use the Pass-Fail option to repeat a course.

Degree Requirements

Bachelor of Arts

Satisfaction of these requirements ensures satisfaction of the University general education requirements (see page 16).

1. 128 credits.
2. At least a 2.0 cumulative average in all courses completed at the University of New Hampshire.
3. Four courses, **outside the student's declared major,** from among the biological sciences, physical sciences, and mathematics. (Courses must be of at least three credits each.)
4. Two courses in humanities, selected from those offered in arts, English (beyond 401), foreign languages (beyond 401-402), humanities, music, philosophy, and speech and drama, **outside the student's declared major.** (Courses must be of at least three credits each.)
5. Two courses in social sciences, **outside the student's declared major.** (Courses must be of at least three credits each.)
6. Two additional humanities or social sciences courses, **outside the student's declared major.** (Courses must be of at least three credits each.)
7. Six additional courses, **not in a student's declared major,** selected from all courses offered by the University. English 401 must be taken in the freshman year as one of these courses, unless the student is exempted. Students exempted from English 401 must substitute a course **not in the student's declared major,** to make up a total of six courses in this category. (Courses must be of at least three credits each.)
8. Foreign Language Requirement: Proficiency in a foreign language at the level achieved by satisfactory work in a one-year college-level course is required of all students. This requirement may be fulfilled by achieving a score of 500 or better on a College Board foreign language achievement test, or by completing a full-year elementary course in any foreign language, or by completing a semester of a course in foreign languages numbered 501 or above, if eligible. This requirement must be satisfied by the end of the sophomore year.
9. Major Requirements: A student must complete at least 32 credits of major course work with grades of C- or better, and an average of 2.0 or better. The student's declared major may require a senior paper or project, and/or a comprehensive examination.

Bachelor of Science

See Schools and Colleges for degree requirements.

Associate in Arts

1. The completion of 64 credit hours with a minimum grade-point of 2.0 based on a 4.0 scale.
2. General education requirements:

The specific courses that satisfy b, c, and d (below) of the general education requirements are currently under review. The list will be available by Registration Day, Semester I 1976.

a. English 401 or its equivalent

b. A minimum of three courses of at least three credits each in sciences or mathematics, chosen from applicable 400- or 500-level courses (or, by petition, chosen from 600-level and 700-level courses).

c. A minimum of two courses of at least three credits each in the arts or humanities, chosen from applicable 400- and 500-level courses (or, by petition, chosen from 600- and 700-level courses).

d. A minimum of three courses of at least three credits each in the social sciences, chosen from applicable 400- and 500-level courses (or, by petition, chosen from 600- and 700-level courses).

3. The remaining courses or credits may be earned in career option and/or elective general education courses.

4. The last 16 hours of credit must be completed through the Division of Continuing Education at UNH unless permission is granted to transfer a part of this work from another institution.

Dual Degree Option

General Policy: The option to pursue two degrees simultaneously enhances and broadens the education of certain students at the undergraduate level. The program is only for those students who can adequately handle the requirements for two different degrees and who can reasonably allocate the additional time and effort needed for the program.

Requirements

1. Students desiring a dual degree must petition the college dean or deans involved for permission to pursue a dual degree.

2. If the student is planning to take one degree in a highly prescribed curriculum, s/he should register as a freshman in the appropriate school or college for that curriculum.

3. It is expected that a candidate for two degrees will complete the equivalent of five years of academic work.

4. The two degrees, as awarded by the University of New Hampshire, must be different (i.e., B.A. and B.S., or B.S. and B.S. in Chemistry). Transfer students already holding a baccaleaureate degree from another accredited institution may pursue an additional baccalaureate degree at the University of New Hampshire provided they fulfill the above requirements. The degree received at the first institution will be accepted by the University of New Hampshire as awarded by that insitution.

Supervision: As soon as a student is accepted as a candidate for two degrees, the appropriate dean(s) will appoint supervisors for each of the proposed majors. The supervisors and the student will work out a basic course plan for the two degrees and inform the appropriate dual degree dean(s) of the plan. The supervisors will maintain joint control over the student's academic program. The college offices and the supervisors will receive copies of grade reports and other records for students pursuing two degrees.

Student Designed Major

See page 81 for requirements for student designed major.

Second Major Option

Students may choose to fulfill the requirements of two dissimilar major programs, provided they obtain the approval of their principal adviser and the dean(s) of the college(s) in which the programs are offered and comply as follows:

1. If the two majors are offered in different schools or colleges within the University, the admission requirements of each must be satisfied.

2. If the two majors have two distinct degrees, e.g., B.A., B.S., or some other designated degree, the student must choose which of the two is to be awarded and fulfill all requirements for that degree.

3. No more than eight credits used to satisfy requirements for one major may be used as major requirements for the other.

Minor Option

A student may earn a minor in any undergraduate discipline in the University in which permission to do so can be arranged by the student in consultation with the major adviser and the minor supervisor. A minor consists of 20 semester hours with C- or better and a 2.0 grade average in subjects that the minor department approves. (Courses taken on the Pass-Fail basis may not be used for a minor.) No more than 8 credits used by the student to satisfy major requirements may be used for the minor. A student should declare an intent to earn a minor as early as possible and no later than the end of the junior year. During the final term an application whould be made to the Dean to have the minor shown on the transcript.

Minimum Graduation Average

A cumulative grade point average of 2.0 is the minimum acceptable level for undergraduate work in the University, and for graduation from the University. The Academic Standards and Advising

Committee examines the records of students periodically, and may place academically deficient or potentially deficient students on warning, or may exclude, suspend, or dismiss those who are academically deficient.

Quota of Semester Credits

Any student registering for more than 20 credits must receive the approval of the college dean.

An undergraduate is assigned class standing on the basis of semester credit hours of academic work completed with a passing grade, as follows: to be a sophomore—26 credit hours; to be a junior—58 credit hours; to be a senior—90 credit hours.

Residence

Students who are candidates for a bachelor's degree must attain the last one quarter of total credits for the degree in residence unless granted permission by the Academic Standards and Advising Committee to transfer part of this work from other accredited institutions.

Withdrawal from the University: Students who leave the University are expected to file formal withdrawal notification with the Registrar.

College of Liberal Arts

Allan Spitz, Dean
Melville Nielson, Associate Dean
James A. Smith, Associate Dean
Nancy Wolters, Assistant to the Dean
George T. Abraham, Academic Counselor
Robin Olmsted, Academic Counselor

Divisions and Departments

Biological Science Division
Microbiology Department
Zoology Department

Humanities Division
The Arts Department
English Department
French and Italian Department
German and Russian Department
Music Department
Philosophy Department
Spanish and Classics Department
Speech and Drama Department

Social Science Division
Geography Department
History Department
Political Science Department
Psychology Department
Social Service Department
Sociology and Anthropology Department

Teacher Education Division
Education Department

Programs of Study

Bachelor of Arts
Anthropology
The Arts
  Studio
  Art History
Classics
English
English Teaching
French
Georgraphy
German
Greek
History
Humanities
Latin
Linguistics
Microbiology
Music
  Music History
  Performance Study
  Music Theory
  Pre-Teaching
Philosophy
Political Science
Psychology
Social Service
Sociology
Spanish
Speech and Drama
  Communications
  Theater
Zoology

Bachelor of Science
Biology
Music Education

Bachelor of Fine Arts

Bachelor of Music
Piano
Organ
Voice
Strings, Woodwind, Brass, or Percussion
Theory
Music Education

General Information

Purpose and Objectives

It is the purpose of the College of Liberal Arts, as a center of learning and scholarship, to help all of its members achieve an understanding of the heritage of civilization and to educate them in the tradition of the past and realities of the present so that they may recognize and act upon their obligations to the future.

The College endeavors to meet the educational needs of each student through the development of interests and skills which, combined with the student's potential, makes possible the living of a richer and more useful life.

Programs of Study

The College of Liberal Arts offers four degrees: Bachelor of Arts, Bachelor of Science, Bachelor of Fine Arts, and Bachelor of Music.

Bachelor of Arts programs are intended primarily to provide a broad liberal education along with a major in one of the fields listed above. Requirements for the Bachelor of Arts degree and information regarding these majors are presented in the section entitled Bachelor of Arts Program in the University Academic Requirements.

The Bachelor of Science curriculum consists of an interdepartmental program in biology. It is arranged in such a manner as to permit students considerable specialization while providing them with a broad cultural education. Requirements for the Bachelor of Science degree and information regarding the biology curriculum are presented in the section entitled Bachelor of Science Curriculum in Biology.

Bachelor of Fine Arts curriculum is designed to provide training for the student who plans to enter professional graduate school. Requirements for the Bachelor of Fine Arts curriculum are outlined in the section entitled Bachelor of Fine Arts Curriculum.

The Bachelor of Music curriculum is designed to provide professional training in applied music, in musical theory, and in music education, and to allow students to develop their talent to the equivalent standard of that offered by conservatories of music. Requirements for the Bachelor of Music curriculum and information regarding this curriculum are presented in the section entitled Bachelor of Music Curriculum.

Note: Although the University will try to provide sufficient facilities so that a student may pursue any major or curriculum for which the student meets the requirements, such a privilege cannot be guaranteed. Rapidly increasing enrollment sometimes results in the crowding of required specialized courses beyond capacity. On occasion a student may remain in a crowded curriculum if willing to take certain courses during the summer session.

Combined Programs of Study

In addition to pursuing a single major, a student may combine programs of study as follows:

Minor Option: See page 18 for requirements.
Second Major Option: See page 18 for requirements.
Dual Degree Programs: See page 18 for requirements.
Student Designed Major: See page 81 for requirements.

Preparing for Teaching

Five-Year, Undergraduate-Graduate Program

The major avenue for becoming certified to teach at the elementary, middle, and high school levels is an integrated undergraduate-graduate program culminating in a fifth year, yearlong internship. Before the internship the student will earn a bachelor's degree outside the field of Education. The internship offers 6-12 graduate credits and will normally be coupled with other graduate work leading to a master's degree. A number of existing UNH master's degree programs may be elected including two degree-programs specifically designed for preservice teachers and offered by the Department of Education. (See Graduate Catalog for description.)

Step 1. Register for Education 500 (preferably in sophomore year).

The initial undergraduate phase of the program, Education 500, Exploring Teaching, provides an early experience in the schools as

teacher aide and teaching assistant. Students may select this four-credit course at any time: however, most students should choose it prior to completion of their sophomore year. In this initial phase students explore various kinds of teaching roles, working side by side with experienced teachers, so that they may make realistic decisions about teaching as a career.

Step 2. Apply to Department of Education for admission to the second phase of the teacher education program and apply for a co-adviser from that Department. Plan a program that includes a minimum of 4 credits in each of the following courses: Education 700; 701; 703; 705 (total 16 credits). Since there is no undergraduate major in Education, students must have selected and completed a major in another department for a baccalaureate degree.

Upon successful completion of the initial phase, the student will be eligible to begin the second phase of the teacher education program. This phase requires a minimum of four credits to be completed in each of four areas of study: Ed. 700, Educational Structure and Change; Ed. 701, Human Learning and Development; Ed. 703, Alternative Teaching Models; and Ed. 705, Alternative Perspectives on the Nature of Education. Upon decision to enter the second phase of the program, a co-adviser will be appointed in the Department of Education to assist the student in designing the most appropriate course of studies.

A number of variable credit modules will be available to the student in each of the required four course areas, including experiences and workshops in local schools. Certain courses in other departments may substitute for these requirements. Working closely with advisers, students may deveop highly individualized programs, choosing from many alternatives. Since credits in these four areas of study may be taken at either the undergraduate or graduate level, students will have greater flexibility for fulfilling the requirements of their college and major departments.

Additional requirements for elementary school teaching include: one course in elementary school reading (Education 706, Introduction to Reading in the Elementary Schools); and two courses in mathematics appropriate for elementary school teaching (recommended—Math 621, Number Systems for Elementary School Teachers; Math 622, Geometry for Elementary School Teachers; Math 623, Topics for Elementary School Teachers; 703, Mathematics-Education, K-6).

Step 3. Apply for admission to the fifth year internship and master's degree program.

The final phase of the teacher education program will consist of a year-long internship (Education 800-801). **Students must apply for the fifth year internship and master's degree program by September 15 of their senior year** so that they will have enough time to explore a variety of carreer and/or graduate study options and finalize their program plans before second semester of the senior year. Opportunities exist for admitted graduate students to take courses toward their master's degree in the second semester of their senior year.

Prior to the intern year students will complete a B.A. or B.S. program with a major in a field outside of the field of education, and thus they will have opportunites for jobs outside the field of education, a broader general education, and greater depth in their area of specialization.

If accepted into the internship and master's degree program, students will have many options from which to choose, including selection of additional courses for further specialization, and selection of workshops and courses offered for credit in intern site schools. During the internship, the student will have an opportunity to work with resident supervisors and other interns in various team teaching arrangements.

Financial Aid: A limited number of paid internships is available. Students will be hired by participating school districts. Other financial assistance is possible through the office of Financial Aid.

Criteria for admission to fifth year: Before being eligible for an internship, a student must satisfy the following criteria: 1) favorable rating from school personnel who have worked with the student in Exploring Teaching and in any other clinical experience; 2) favorable rating from UNH staff supervising Exploring Teaching and other clinical experience; 3) favorable recommendation from instructors of professional course work; 4) favorable recommendation from the student's major program, including approval of the major program as appropriate for secondary school teaching; 5) admission to the UNH Graduate School—which requires a minimum 2.5 cumulative GPA, Graduate Record Examination scores, and appropriate letters of recommendation; 6) available space in the program.

Undergraduate Certification Option

Because of the professional orientation of majors in Occupational Education, Home Economics, Physical Education, and Music Education, an undergraduate option for teacher certification in these areas may be elected. This option will require the same professional education components as listed above with the election of one semester of student teaching instead of the year-long internship. Successful completion of Education 500 and positive recommendation from school site staff are required for further professional work. Final screening will take place prior to the student teaching semester. *Application for acceptance into student teaching must be filed by February 15 of the junior year.*

Academic Standards for Eligibility to Apply for the Teacher Education Programs

Integrated Undergraduate-Graduate option with year-long internship and master's degree: Academic record suitable for admission to graduate school.

Four-Year Undergraduate Option: minimum 2.5 GPA in major; minimum 2.2 cumulative GPA at time of application for student teaching (February 15 of junior year).

These programs have limited capacity and admission to the University or satisfaction of minimum academic standards as stated above does not guarantee admission to the teacher education programs.

Accreditation and Certification of Teaching

The teacher education programs at the University are accredited by the New Hampshire State Department of Education and by the National Council for the Accreditation of Teacher Education. Completion of the approved teacher preparation program of the University qualifies a student for certification as a teacher in most states.

UNH Offers Approved Programs Only in the Following Areas: Agriculture, Art, Biology, Chemistry, Early Childhood Education, Earth Science, Elementary Education, English, French, German, Latin, Physical Education, Physics, Home Economics, Mathematics, Music, Occupational Education, Social Science, Spanish, Speech Therapy, Speech and Drama. For secondary certification students must have completed an approved major program or its equivalent in the teaching field.

For further information contact the Coordinator of Teacher Education.

Bachelor of Arts Program

The Bachelor of Arts Program provides a broad liberal education with a concentration involving a minimum of 32 credits in a major field.

The requirements apply to all students who enter the College of Liberal Arts between July 1, 1976, and June 30, 1977, and are seeking a Bachelor of Arts degree. (Students who entered the College at an earlier time may apply for a change to the requirements of this catalog.)

Bachelor of Arts Degree Requirements

See page 17 for requirements.

Majors in the Bachelor of Arts Program in the College of Liberal Arts

The student's declared major may specify certain (but not more than 13) required courses which constitute the major. A major must be declared prior to the beginning of the junior year.

The objectives, opportunities, and department requirements of majors in the Bachelor of Arts program are described in the paragraphs which follow.

Anthropology

The Anthropology major is offered by the Anthropology section of the Department of Sociology and Anthropology. It provides an introduction to the various branches of anthropology and an appreciation of its place among the other academic disciplines. At the same time it is designed to encourage intensive study of particular topics within the field according to the interests and talents of the student. It is intended to provide both a broad basis for the education of the general student and to offer sufficient background for those who may wish to pursue a career in anthropology at the graduate level.

Students majoring in anthropology are required to take a minimum of 32 credits distributed as follows: Anthropology 411 and 412, one topical course, one ethnographic-area course, and

any four other courses in anthropology or related disciplines approved by the supervisor.

Departmental Honors Honors in Anthropology will be awarded to those students who achieve at least a B+ average in courses counted toward the major and complete satisfactorily a four-credit senior thesis under the guidance of a faculty member in addition to the regular requirements of the major. Students wishing to work for honors should inform the Undergraduate Committee of their intent during the second semester of their junior year, appending their academic record and a statement of the area in which they intend to write a thesis.

Students wishing to major in anthropology should consult with Professor Richard E. Downs.

The Arts

The courses offered by the Department of The Arts provide an opportunity, within the Liberal Arts framework, for serious art students to acquire a thorough knowledge of the basic means of visual expression, to acquaint themselves with the history of art, or to prepare themselves for a career in art teaching. In addition, these courses are designed to offer foundation experience for students interested in art, but who are majoring in other departments in the University. The Department of The Arts offers programs leading to a Bachelor of Fine Arts degree (described later in the Chapter) and a Bachelor of Arts degree. Certification for art teaching in the public schools is also offered in cooperation with the Department of Education. (See Preparing for Teaching.)

Candidates applying for the Arts major, studio option, or the Bachelor of Fine Arts program are required to submit a portfolio. There is no portfolio requirement for those entering the art history option of the Arts major. The University reserves the right to retain a selection from a student's work for a period of not more than two years.

The Arts major leading to a Bachelor of Arts degree is offered with two options: studio and art history.

Studio Option

Students selecting the studio option must complete a minimum of 11 courses (44 credits), of which the following are required: Arts 432, Drawing I; one course from the following: Arts 501—Ceramics I, Arts 513—Jewelry and Metalsmithing I, Arts 525, Woodworking, or Arts 567—Sculpture I; Arts 475 and 476—History of Western Art I and II; three elected art history courses; three elected studio courses; and one 600-level studio course. The foundation courses (Arts 432, 475, and 476) must be completed during the first year.

While the above represents the minimum departmental requirements for the studio option, students may wish to plan a program involving greater depth in one or several of the studio areas in the department.

Art History Option

Students selecting the art history option must complete a minimum of 10 courses (40 credits) of which the following are required: Arts 475 and 476, History of Western Art I and II; Arts 431, Visual Studies; a seminar in Art History, Arts 675-678; five additional courses in art history; and one basic studio course, Arts 432, Drawing I. Completion of Arts 475 and 476 with a grade of C or better is a requirement for acceptance as an art history major. Art history majors will receive preferential placement only in the following studio course: Arts 432. Those students majoring in art history are strongly advised to take English 501, Introduction to Prose Writing, and two foreign languages, one of which should be German.

Art Education Curriculum

The program in art education is organized into a five-year, teacher-education sequence.

This curriculum is designed to prepare teachers and supervisors of art in the public schools. Completion of the B.A. or the B.F.A. degree prior to a fifth year internship is necessary for teacher certification. Courses are prescribed to provide a sound background in studio and educational practices and to allow enough flexibility so that a student can develop a high degree of competency in a particular studio area. The satisfactory completion of the B.A. or B.F.A. curriculum and the fifth-year internship will satisfy the initial certification requirements for teachers of art in the public schools of New Hampshire and in most other states.

Classics

The Classics major is offered by the Classics section of the Department of Spanish and Classics. The minimum requirements for a major in Classics are as follows: 40 credits offered by the Classics section, excluding Latin 401-402. Twenty-four of these must be in courses in Greek and Latin. The student will be encouraged to take courses in related fields such as ancient history, classical art, modern languages, and English.

The Department also offers an honors program in Classics. Participation in this program entails completion of the major requirements plus a senior research project and paper.

The supervisor for majors is the Chairperson of the Department, Professor John C. Rouman.

Commmunications

Communications is one of the two majors offered in the Department of Speech and Drama. The major emphasizes a broad, integrative approach to theories and practices of verbal, non-verbal, mass communications, and other forms. Interdepartmental course work, reasonable course substitution on an individual basis, proficiency exemption, and field or laboratory work are encouraged to meet individual communications needs or goals. Communications course work can be readily related to social sciences, humanities, etc., and provides a pre-professional preparation for vocations such as law, public relations, personnel work, mass communications, cinema, etc.

Majors in communications shall elect ten courses (40 hours) distributed as follows: Speech and Drama 402 and 403 and eight courses in an area selected in consultation with an adviser. A student and adviser must agree upon the courses used to establish an area of emphasis before the student enrolls in such courses. All courses must be directly related to the building of competence in the area of emphasis. Courses not offered in the department but offered as regular courses in the University, may be used to establish an area of emphasis in communications.

Students interested in majoring in Communications should consult with the chairperson of the Department of Speech and Drama. Students wishing to transfer to the University of New Hampshire in Communications must first have the approval of the department.

English

The Department of English offers two programs of study: the English major and the English-teaching major.

The English Major The English major has two chief objectives: to provide all students with a common core of literary experience and to provide each student with the opportunity of shaping a course of study to suit individual interests. The flexibility and freedom inherent in the second of these objectives places a responsibility upon the student to devise a program which has an intelligent rationale. For example, the student who intends to pursue graduate study in English literature should choose more than the minimum number of advanced literature courses and should seek a broad, historical background. Students with special interests in linguistics or writing may, on the other hand, wish to elect only the minimum number of advanced literature courses required for the major. All students should secure the assistance and approval of their advisers in formulating an early plan for the major program. For full details see the booklet entitled "The English Major," available at the Departmental office, Hamilton Smith 113.

The English department offers a journalism program which, though not a major, prepares students to become professional journalists upon graduation. The program consists of five sequential writing courses which the student should begin no later than the second semester of the sophomore year. Internships at daily newspapers are available. Students interested in this program should inquire at the departmental office.

For the English major, students must complete 32 credits of major course work including: English 519, two additional 500-level courses, and seven courses numbered 600 and above. In selecting these courses, students must be sure to meet the following distribution requirements:

1. Two courses in literature prior to 1800: either two advanced courses (numbered above 600), or one advanced course and English 513.

2. Two courses in literature since 1800: either two advanced courses, or one advanced course and one course from the following list: English 514, English 515, English 516.

The English Teaching Major This major is designed for students wishing to teach English in middle or high schools. Completion of this undergraduate major does not in itself, however, meet state certification requirements. To meet these requirements students should enroll in the undergraduate major and, by September 15 of their senior year, apply for the fifth year teaching internship and master's degree program. (For a full description of requirements for the integrated undergraduate-graduate program for teachers, and its several options, see the section entitled "Preparing for Teaching," page 21.) Undergraduate English teaching majors must pass average of 2.5 or better: English 512, 514, 710, 711, 712, 718 or year. They must also pass the following English courses with an average of 2.5 or better: English 512, 514, 710, 711, 712, 718 or 719, 757, 791, and two additional literature courses numbered above 700. English 513 may be substituted for the second 700-level course.

Students who are interested in majoring in English should consult with the chairperson, Professor Donald Murray.

French

The French major, in addition to its intrinsic value in the context of the liberal arts, provides knowledge of the language, literature, and culture of France which is useful in a number of careers such as teaching, business, law, and social service. Prospective teachers should consult "Preparing for Teaching," page 21. Students interested in nonteaching careers are urged to consult with the Department of French and Italian and with other appropriate departments early in their academic careers. Special attention is called to the minor in Administration offered through the Whittemore School.

A *major* consists of a minimum of 36 credits. French 401-402, 501, 503-504, 514, 621, and 622 do not count toward a major. French 605-606 and 790 are required of majors. Majors are encouraged to take courses in the literatures of other countries as well as in fields such as music, art, philosophy, history, political science, and sociology which provide insight into non-literary aspects of culture. A *minor* in French consists of 20 credits in French courses numbered 501 and above. The department chairperson supervises the work of both majors and minors.

The Department also offers a junior year abroad at the University of Dijon. This program is open to all qualified students at the University of New Hampshire. See Description of Courses, French 685-686. Early consultation with the Department is urged.

Geography

Geography is best defined as the discipline that describes and analyzes the variable character, from place to place, of the earth as the home of man. As such, geography is an integrating discipline, studying many aspects of man's physical and cultural environment that are significant to understanding the character of areas or the spatial organization of the world.

Because its integrating character establishes common areas of interest with many other fields of knowledge, geography is an excellent core discipline for a liberal education. Thus, students who have a primary interest in the spatial organization or the regional character of the world and who also desire a liberal education can attain these goals by majoring in geography. Those wishing to prepare for careers as professional geographers are advised to concentrate their course work in geography and closely related fields, and should plan to go on to graduate study after completing an undergraduate major in geography.

Students who major in geography are required to take Geography 401, 402, and seven additional courses in geography or related fields approved by their supervisor to a total of 28 semester credits. The seven courses should include Geography 570, 572; 581, 582; 797; and two additional intermediate level courses in geography.

A minor in Geography consists of five courses (20 credits) in Geography.

Students interested in majoring in Geography should consult with the supervisor, Professor William H. Wallace.

German

The Department of German and Russian offers a major in German only. This program is designed to be of interest to the following groups of students:

1. Those who have a special interest in the German language, literature, and culture.
2. Those who intend to enter professions in which a background in foreign languages and literatures is desirable. Examples of such professions are library science, international banking, trade, science, and government services.
3. Those who plan to teach the German language in secondary schools. Since most secondary schools require their teachers to teach more than one subject, students planning to enter teaching at this level must plan their programs carefully. They should combine a major in one of the languages and its literature with a minor or at least a meaningful sequence of courses in another subject.
4. Those who intend to go on to graduate study in the field of Germanic linguistics and literature. Such graduate study is requisite to teaching at the college level and to other specialized work in the field.

The department offers a junior year abroad at the University of Salzburg. This program is open to all qualified students at the University of New Hampshire. See description of courses, German 685-686.

A major must comprise a minimum of 36 credits in German language, literature, and culture beyond German 504. German 525, 526, 601, 602 (or their equivalents), 781, and eight other credits on the 600 or 700 level, excluding German 791, are required for all majors. Achievement examinations will be given at the end of the junior and senior years.

Greek

The Greek major is offered by the Classics section of the Department of Spanish and Classics. The supervisor for majors is the department chairperson, Professor John C. Rouman.

The minimum requirements for a major in Greek are as follows: 32 credits in Greek, including Greek 401-402. The student will be encouraged to take courses in related fields such as Latin, Classics, and ancient history.

The Department also offers an honors program in Classics. Participation in this program entails completion of the major requirements plus a senior research project and paper.

History

Students majoring in history must complete 32 credits in history courses numbered 500 or above. These courses must include a minimum of one semester-course from each of the first three groups as given in the Description of Courses offered by the department. At least four semester-courses of the total must be numbered 600 or above. This must include History 697, Colloquia for History Majors, which every senior student majoring in history is required to complete with a grade of C- or better. History majors should register with the department for a particular section of this course at some time shortly before the beginning of the senior year.

Students intending to major in History should consult with the chairperson of the department. Suggested programs for students with special interests or professional plans are available in the department office.

Humanities

The major in humanities allows a student to design and pursue under faculty guidance a coherent interdisciplinary program in the humanities (art, drama, language, literature, music, philosophy). The student defines the subject and selects a program of related courses. The subject may be a historical period or any other topic which can be explored through several disciplines in the humanities. The program must have clear educational and intellectual merit, and prepare the student to undertake a senior project of at least four credits on the subject (Humanities 699). The program must be sponsored by a faculty member from the Humanities Division and approved by the Humanities Steering Committee.

Students who wish to become Humanities majors should submit a formal proposal to the Steering Committee by the end of the sophomore year. Normally, a student should have a grade-point average of at least 2.7. The student should select most of the courses for the program from those offered for major credit by departments within the Humanities Division, but the student is encouraged to include courses from outside the Division (especially from History) when they are appropriate to the major subject. The number of courses in the program may vary, but at least 32 credits of major coursework must be completed.

Before submitting formal proposals, interested students are urged to seek the advice of Steering Committee members and other faculty in the Humanities Division. Inquiries about the Humanities major should be directed to: Anthony Caldwell, coordinator of the Humanities major, Department of English.

Latin

The Latin major is offered by the Classics section of the Department of Spanish and Classics. The supervisor for majors is the chairperson of the Department, Professor John C. Rouman.

The minimum requirements for a major in Latin are as follows: 32 credits in Latin, excluding Latin 401-402. The student will be encouraged to take courses in related fields such as Greek, Classics, and ancient history.

The Department also offers an honors program in Classics. Participation in this program entails completion of the major requirements plus a senior research project and paper.

Linguistics

Linguistics cuts across the boundaries between the sciences and the humanities; it is the study of the most important characteristic of human beings: language. This interdepartmental program is an excellent liberal arts major or a suitable pre-professional major for law, medicine, clergy, etc. Second majors with a foreign language or vocational degrees such as hotel management are appropriate.

Requirements: Eight four-credit courses (four core courses and four electives), and a language requirement.

Language requirement Two years college study, or equivalent of one foreign language; one year study of a second language from a different language family or sub-family.

Core requirements Students must choose at least one course from each of the following groups:

1. General Linguistics: Classics 605, Introduction to Comparative and Historical Linguistics; English 718, English Linguistics (sophomore year for majors). (Both courses are recommended for majors.)

2. Phonology: Speech and Drama 524, Applied Phonetics of American English; English 793, Phonetics and Phonology.

3. Semantics and Syntax: English 794, Syntax and Semantics; Philosophy 745, Philosophy of Language; Speech and Drama 572, General Semantics; Psychology 712, The Psychology of Language; Anthropology 620, Anthropological Linguistics.

4. Historical and Comparative Linguistics: English 752, History of the English Language; German 781, History and Development of the German Language; Spanish 795, History of the Spanish Language; Greek or Latin 795,-Comparative Grammar of Greek and Latin.

Area Courses Under the direction of an adviser assigned by the Advisory Committee the student will complete the program with a minimum of four courses from one or more of the following areas:

1. English: 719, English Grammar; 718, English Linguistics; 715, Applied Linguistics: Teaching and Learning Foreign Languages; 716, Problems in Applied Linguistics; 752, History of the English Language; 753, Old English; 754, Beowulf; 793, Phonetics and Phonology; 794, Syntax and Semantics.

2. Foreign Language: German: 781, History and Development of the German Language; 795, Independent Study in the Phonology of German, The Structure of Modern German, Germanic Linguistics, Gothic, Old Frisian, Middle High German, and Old High German; Spanish: 601, Spanish Phonetics (2 credits); 795, History of the Spanish Language. Classics: 605 (Classics), Introduction to Comparative and Historical Linguistics; 601-602 (Greek), Greek Prose and Composition; 795-796, R14 (Greek), Greek Epigraphy; 795-796, R16 (Greek), Comparative Grammar of Greek and Latin (same as Latin 795-796, R21); 795-796, R17, (Greek), Homer: A Linguistic Analysis; 601-602 (Latin), Latin Prose Composition; 795-796, R19 (Latin), Latin Epigraphy; 795-796, R20 (Latin), Italic Dialects; 795-796, R21 (Latin) see Greek 795-796, R16, Hittite and Sanskrit by arrangement with Department.

3. Philosophy: 412, Introduction to Logic, Language, and Scientific Method; 745, Philosophy of Language; 550, Symbolic Logic; 615, Survey of Recent Analytic Philosophy.

4. Psychology: 511, Introduction to Perception, Language, and Thought; 601, Statistics and Methodology in Psychology; 712, Psychology of Language; 713, Cognition; 731, Brain and Behavior; 812, Psycholinguistics; 814, Cognitive Processes.

5. Sociology & Anthropology: 620, Anthropological Linguistics.

6. Speech and Drama: 524, Applied Phonetics of American English; 572, General Semantics; 630, Psychology of Communication; 638, The Acquisition of Language; 673, Experimental and Descriptive Studies in Oral Communication; 681, Theories of Language.

Minor in Linguistics: Any six of the above courses may fulfill the requirements for a minor in Linguistics.

Students interested in majoring in Linguistics should consult with the Coordinator of the Interdepartmental Linguistics Program or with any of the professors who teach linguistics courses.

Microbiology

Students interested in the study of microorganisms, particularly bacteria and viruses, should register as majors in microbiology. Such students may prepare themselves for a career in city, state, or federal government service, or a position with universities, research institutes, or industrial organizations. Opportunities are available in the areas of general, medical, public-health, environmental, and marine microbiology, and in virology.

Students majoring in microbiology are expected to complete courses offered by the department, and by related departments, to a total of 32 semester credits. A minimum of 24 semester credits from department offerings must be completed. Courses in organic chemistry and biochemistry are required. It is strongly recommended that students also take courses in mathematics, physics, and quantitative chemistry. The courses of each major program are selected to meet the needs of the individual student, as determined by the student and supervisor.

Students interested in majoring in microbiology are advised to consult with Professor Galen E. Jones.

Music

The Department of Music offers two degree programs: the Bachelor of Arts, and the Bachelor of Music. The Bachelor of Music degree is discussed in a separate section of this chapter.

The Bachelor of Arts program offers the student an opportunity to major in music within the liberal arts curriculum. This program is intended for those who wish to pursue the serious study of music and to acquire at the same time a broad general education; it is recommended for those considering graduate study leading to the M.A. or Ph.D. degrees, or the five-year undergraduate-graduate program in Teacher Education.

To be formally admitted to the B.A. program, a student must give evidence of satisfactory musical training by taking an admission audition. A student must declare music as a major prior to the beginning of the junior year, but it is highly recommended that the student declare as early as possible considering the large number of required courses. A student's admission to the upper level of the degree program will be subject to review by the Music Department faculty.

The Bachelor of Arts degree is offered with four options: Music History, Performance Study, Music Theory, and Pre-teaching. All students must complete a minimum of 32 credits of course work in music, of which the following are required: Music 471-472, 473-474, 571-572, 573-574, and 501-502. In addition, the specific requirements for each option are given below.

Option I: Music History: advanced theory (4 Credits); advanced history and literature (12 credits); any one of 541-550 inclusive (8 credits). A student must also demonstrate the ability to sight-read a Bach chorale harmonization.

Option II: Performance Study: Advanced theory or literature (4 credits); performance study (16 credits—two credits per semester). Qualified students may major in voice, piano, strings, woodwinds, brass, or percussion. Voice majors must successfully complete, in addition to the foreign language requirement, one of the following course sequences: Italian 401-402, German 401-402, French 401-402.

Option III: Music Theory: advanced theory (12 credits); advanced history (4 credits); any one of the 541-550 inclusive (8 credits). A student must also demonstrate the ability to sight-read a Bach chorale harmonization. The emphasis in this option is on musical composition and/or theory.

Option IV: Pre-Teaching: Music Education 500; Music 551-552; Music 779; techniques and methods (8 credits); 8 credits from Music 441-453 inclusive; 8 credits from any one of Music 541-550 inclusive; piano proficiency. (See page 21, Preparing for Teaching, the Bachelor of Science in Music Education is being phased out.)

A public performance is given during the senior year—for music-history majors this must be a lecture or lecture-recital; for performance majors, a full recital; for theory majors, a lecture, lecture-recital, or a recital including at least one original composition; for pre-teaching majors, a half-recital is the minimum. A more detailed description is available from the Department of Music.

All students minoring in music must complete a minimum of 20 credits of course work in music, of which the following are required: Music 471-472, Music 501-502.

The Department of Music is a member of the National Association of Schools of Music. Prospective B.A. majors in music are advised to consult with Professor Paul Verrette.

Philosophy

400-level courses are self-contained introductions to philosophy. They may be taken in any number and order. 500-level courses may also be taken without prerequisite; they provide a more systematic comprehension of philosophy and a foundation for advanced work. Most 600-700 courses require previous philosophy, although Philosophy through Literature and Philosophy of Natural Science are open to upper-class students generally.

The Philosophy Major Philosophy has always been the heart of a liberal education. Philosophy is its own reward. It should deepen and enrich the lives of those who pursue it. It is also an excellent preparation for a variety of vocational and professional pursuits.

The following courses constitute a core required of all majors; 570, 572, 573, 574, and one from 610, 615, 620. Students conscious of a more-than-ordinary interest in philosophy should take these core courses as early as possible.

Beyond the core, a major must select, with the adviser's approval, three additional philosophy courses, at least two of them on the 600-700 level (exclusive of 695-6 and 795-6) for a minimum of eight courses.

Special Interests A student may add to the above major a special interest designed to lay the groundwork for post-graduate education or employment in such areas as law, medicine, business, education, theology, social work, etc. Special advisers are prepared to provide informed counsel to philosophy majors interested in these areas. This special interest can involve up to five courses beyond the basic required eight, either in the philosophy department or outside it, and will be noted in the Department's file for such use as the student may find for it.

Graduate Preparatory Option This option is strongly recommended for any student who plans to do graduate work in philosophy. Beyond the five core courses, such a student should select, with the adviser's approval, six additional philosophy courses above the 400 level, for a total of eleven courses. At least three of these six should be on the 600-700 level (exclusive of 695-6 and 795-6) and one of them should be 550.

Departmental Honors Students accepted as honors candidates will write, under the guidance of an adviser (usually during the second semester of the senior year while registered in 695-6) an original paper in philosophy. If completed successfully, this will entitle the student to receive a Letter of Commendation.

Philosophy Minor Philosophy is interdisciplinary; thus, it makes an excellent minor for any major field. Any five philosophy courses constitutes a minor.

Political Science

The study of politics, to which the courses and seminars of the Political Science Department are devoted, includes the development of knowledge of political behavior by individuals and groups as well as knowledge about governments: their nature and functions, their problems and behavior, and their interactions—at the national and international levels and at the local, state, and regional levels.

Much of the learning offered by the Political Science Department can also be regarded as essential for good citizenship, since political knowledge helps to explain both the formal institutions by which societies are governed and the issues which encourage people toward political interest and political action. In addition, such learning is especially valuable to students planning to enter local or national government or other public service, including the foreign service, and will be of great help to those who intend to study law and enter the legal profession. For teaching, particularly at the college level, and for many types of government service, graduate work may be indispensable; and an undergraduate major in Political Science will provide the most helpful foundation for

later graduate study in the field. Such an emphasis will also be valuable for students seeking careers in journalism, international organizations, and the public affairs and administrative aspects of labor, financial, and business organizations.

The major in Political Science consists of a program chosen to develop an understanding, beyond the introductory level, of at least three of the five fields in which the Department's courses are offered: Political Thought; Scope and Methods of Political Science; American Politics; Comparative Politics; and International Politics.

The total program for a major will consist of no less than 36 credits and no more than 48 credits in Political Science. Each student is responsible for completing the following requirements: 1) Political Science 401 and 402. (Students who successfully complete the departmental examination on American Institutions may substitute Political Science 531 for Political Science 402.); 2) the core course at the 500 level in at least three fields.

Introductory courses, numbered 401 and 402, are designed for freshmen and should be taken before the end of the sophomore year. Political Science 400 may not be counted for major credit. Courses at the 500 level are the basic or core courses in each field and are prerequisite for further work in those fields by majors; except by permission of instructor (and successful completion of an examination in the case of 531), they are not open to freshmen. Intermediate courses, numbered 600, are open after successful completion of the respective core course. They are not open to freshmen. Courses at the 700 level are specialized and advanced, and are designed for seniors, and juniors of advanced status; they are not open to freshmen or sophomores. Seminars, numbered 790-799, are open only to seniors, and are designed to encourage individual research, exploration, and small group discussion with faculty.

Majors planning to pursue graduate work should make arrangements to take the Graduate Record Examination early in their senior year. Students planning to apply for law school should plan to take the Law School Admission Test early in the senior year; information is available from the office of the department chairperson. Students who are preparing to teach government courses in secondary schools should coordinate their programs with the Department of Education, and majors in political science should also be aware of second major options outside the department. Majors interested in direct practical experience in public affairs during their undergraduate study may enroll in Social Science 681 and work as an intern in a public agency, pending the sponsorship of a faculty member in the department and the approval of the department chairperson. Departmental colloquia and other special programs involving public-affairs work are sponsored from time to time.

Psychology

A general function of the Department of Psychology is to provide an academic major that will contribute to the broad education of the undergraduate student. Specifically, the student will be exposed to the scientific study of behavior and will achieve an increased understanding of the behavior of humans and animals.

Students majoring in psychology are required to complete 32 credits distributed as follows: 1) Psychology 401; 2) Psychology 601; 3) Two courses, selected from among the following options: Psychology 602, 605, 621, 701 through 749; 4) Two courses from among the following options: Psychology 651, 652, 750 through 789; 5) Two additional courses from among the departmental offerings. Students must have completed Psychology 401 and 601 before being officially admitted as a major.

In the case of the student whose educational goals would best be served by variations in Requirements 3 and 4 above, such variations must be requested in a formal petition prepared by the student explaining the reasons for the request; the petition must be approved by the student's adviser and filed in the student's records.

Psychology majors planning to go on to graduate work should include Psychology 602 or 704 among their courses.

Students declaring psychology as a major may state their preference for a specific adviser and such preferences will be met where possible. Students expressing no preference will be assigned an adviser. Majors may change advisers with the consent of the adviser to whom they are changing.

Social Service

The Social Service major prepares graduates for social work practice within the context of a liberal arts education. It also prepares students for admission to graduate schools of social work and other graduate professional programs in human service professions.

Social Service majors pursue a program which deals with the origin, development, and organization of health and welfare institutions; methods of social work practice; and the relationship of the social work professions to contemporary social issues and problems. Social Service majors gain direct experience and a better understanding of the field in required participation in a social welfare setting for a minimum of 300 hours. The details of the field experience will be arranged between the student and the designated faculty.

Social Service majors are required to take: Social Service 522, 523, 622, 623, 631, and Sociology 601, and one course from each of four designated areas, listing of which will be provided by the student's faculty adviser. Students wishing to major in Social Service should consult with the Chairperson, Professor Pauline Soukaris in Murkland Hall.

Sociology

The major in sociology is designed to provide a degree of concentration in the study of society consonant with a broad liberal education. However, those who wish to teach sociology in secondary schools are advised to consult with the chairperson of the Department of Education for additional courses in related subjects and teaching that may be required. Those who wish to pursue a career in Social Service should consult with the chairperson of that department as to additional courses or possibilities for graduate training. Those who wish to enter graduate programs in sociology should consult with their advisers about additional courses, particularly in the areas of theory, statistics, and methodology, that they should take.

Majors must complete a minimum of 36 semester credits with grades of C- or higher in sociology. Sociology 400 (or 500 and 600), 601, 602, 611, 612 are required. At least two of the additional major courses must be at the 600 or 700 level (not including 795 or 796).

Departmental Honors Honors in Sociology will be awarded to those students who achieve at least B+ average in courses counted toward the major and complete satisfactorily a four-credit senior thesis under the guidance of a faculty member in addition to the regular requirements of the major. Students wishing to work for honors should inform the Undergraduate Committee of their intention to do so during the second semester of their junior year, appending their academic record and a statement of the area in which they intend to write their thesis.

All students interested in choosing sociology as a major should consult with the chairperson of the Departmental Committee for Undergraduate Studies. It is the responsibility of each student majoring in sociology to obtain the latest information from the department office.

Spanish

The major in Spanish is for those students who wish to acquaint themselves more thoroughly with the language, culture, and literature of the Spanish-speaking peoples.

In addition, through the major, the student can achieve practical goals: teaching Spanish in the grade or high schools, or teaching other subjects in bilingual programs. Following advanced degrees, teaching at the college level and engaging in scholarly research, or entering such fields as linguistics or library science are career opportunities. Majors gifted in languages consider the fields of translation and interpretation. With course work in business, sociology, psychology, speech, etc., the Spanish major is uniquely suited to work in Spanish-speaking areas of the world as well as bilingual regions of the United States and also with many governmental agencies.

The Department sponsors Junior Year in Spain and Mexico programs which offer students further opportunity to gain practical experience in the use of the Spanish language. The program is open to non-majors as well (see the course description for Spanish 685-686 for further information).

The minimum requirements for a major in Spanish are as follows: 32 credits in Spanish, excluding Spanish 401-402 and 503. Specific departmental recommendations will be discussed with the undergraduate advisers.

Students intending to major in Spanish should consult with the Assistant Chairperson for Spanish, Professor F. William Forbes, or the undergraduate adviser, Professor Lois Grossman.

Speech and Drama

Please see separate listings under "Communications" and under "Theater" in this section.

Theater

Theater is one of the two majors offered in the Department of Speech and Drama. The major stresses a broad background in the arts within their social framework. The student interested in the creative aspects of speech communication will find an opportunity for personal and pre-professional growth in theater and its drama, with opportunity for independent study of basic theories and personal involvement in active laboratory situations. Theater as a composite art, reflecting life, is closely related to painting, sculpture, music, dance, literature, and philosophy.

The required curriculum for majors in Theater consists of: Speech and Drama 402, 435, and a minimum of eight hours from each of the three areas (Theory/History, Design/Technical, Performance) *plus* one full course or its equivalent from Performance Project (654) and Scenic Arts Project (655). In addition, Senior Seminar I and II (697-698) is required, plus an additional eight hours (distributed or in one area) at the 600-700 level. The courses applicable to each category are available from the student's adviser.

In addition there are three other course sequences available within the Theater major: 1) courses leading to a major that when combined with requirements from the Department of Education qualify the student for secondary school certification: 2) courses leading to a major that when combined with requirements of the Department of Education prepare the student for Elementary certification with an undergraduate specialization in Youth Drama; 3) courses leading to a Theater major with a concentration in Dance. (In order to be eligible to take either of the first two sequences, a student must qualify for the five-year certification program in the Department of Education.

All students interested in majoring in Theater should consult with the chairperson of the Department of Speech and Drama. Students wishing to transfer to the University of New Hampshire in Theater must first have the approval of the Department.

Zoology

The zoology major is designed to prepare students for admission to graduate work, at least two years of which is considered minimal for undertaking professional work in pure or applied zoology. Other students may elect the major, but there will be no reduction in requirements.

The University's location on tidewater and near the open ocean provides an unusual opportunity for study of marine zoology and marine ecology.

Zoology majors must complete 32 credits of biology (botany, biology, zoology) courses. Minimum requirements for the zoology major are as follows: Chemistry 403-404; organic chemistry; calculus (Mathematics 425) or statistics; college physics; Botany 411 or 412; Biology 541; Zoology 412, 518, 527, 604, 729 or 728, plus an elective. A suggested sequence of courses follows:

Freshman: Zoology 412, Botony 411 or 412, Chemistry 403-404, and Math 425 (or INER 528).

Sophomore: Zoology 518 and 527, Biology 541, and Chemistry 545.

Junior: Zoology 604, Physics 403 (and INER 528 if taken in addition or instead of Math 425.)

Senior: Zoology 729 or 728, another biological science course in Zoology or other biological sciences department (may be taken earlier than the senior year.)

Students who are interested in a zoology major should consult the supervisor, Professor Emery F. Swan.

Bachelor of Science Curriculum in Biology

The Bachelor of Science curriculum in Biology is an interdepartmental program which permits students considerable specialization while providing them a broad cultural education.

Degree Requirements These requirements apply to students who enter the College of Liberal Arts between July 1, 1976, and June 30, 1977, and who are seeking a B.S. degree.

1. 128 semester-hour credits
2. At least a 2.0 grade-point average in all courses completed at the University of New Hampshire.

3. All the University General Education Requirements including English 401.

Major Requirements Specific curriculum requirements are presented in detail on page 82.

Bachelor of Fine Arts Curriculum

The Bachelor of Fine Arts curriculum provides training for the student who plans to enter professional graduate school or pursue a professional artist's career. The basic program of six courses is to be completed in the freshman and sophomore years, and consists of drawing (Arts 432, 532), beginning painting (Arts 542), sculpture (Arts 567), and art history (Arts 475 or 476 and 588). Students majoring in a three-dimensional discipline should choose Arts 475 and students majoring in a two dimensional discipline should choose Arts 476. This basic unit of six courses is designed to provide a common body of concepts and techniques for all students enrolled in the program and is intended to raise the level of creative achievements in the advanced stages of the program.

During the junior and senior years the student will concentrate on six courses, two of which must be at the 600 level, in one of the major studio discipline areas of the department. The major studio discipline areas of the department are 1) Ceramics, 2) Drawing/Graphics, 3) Painting, 4) Sculpture, 5) Wood/Furniture Design. The advanced student will also be required to take four studio electives, one elective in art history, plus Arts 589, 20th Century Art, and/or Arts 677, Seminar in Modern Art. Finally, the senior student will be required to take Arts 789, Seminar/Senior Thesis, which culminates in the mounting of an exhibition of the student's work.

Bachelor of Music Curriculum

The Bachelor of Music degree program is offered to students who wish to develop their talent in performance, composition, or music education to a high professional level. The program is recommended to those considering graduate study leading to the Master of Music or Doctor of Musical Arts degrees. Prospective majors are advised to consult with Professor Paul Verrette.

To be admitted to the B.M. program, a student must demonstrate a high degree of musical competence or significant creative ability during an audition or examination. Selectivity is exercised as appropriate to the professional requirements of each programmatic option. The student must formally declare the B.M. as a degree program prior to the beginning of the sophomore year. Continuation into the upper level of the program is subject to review by the Music Department faculty.

A public performance is required during the senior year. (For performance majors this must be a full recital; for theory majors, a lecture, lecture-recital, or a recital including at least one original composition; for music education majors, a half recital is a minimum.) A more detailed description is available from the Department of Music.

The Bachelor of Music curriculum offers concentration in the following areas: Option 1. Piano; Option 2. Organ; Option 3. Voice; Option 4. Strings, woodwinds, brass, or percussion; Option 5. Theory (Composition); and Option 6. Music Education.

Requirements for the degree include: 128 semester credits; a minimum 2.0 grade-point average in all courses completed at the University of New Hampshire; selected general education requirements as listed in the following options; and specific curriculum requirements as indicated. Courses are to be completed generally in their arranged sequence.

Students in music education must maintain a minimum 2.5 GPA in the major, and have a 2.2 cumulative GPA at the time of application for student teaching (February 15 of junior year).

Freshman Year

All Options: English 401, Freshman English; General Education Requirements—selected science (2 courses), selected social science; Music 471-472, 473-474.

Option 1.	Music 542 (8 credits.
Option 2.	Music 544 (8 credits).
Option 3.	Music 541 (8 credits); Music 542 (2 credits); Music Laboratory—Choral, (2 credits).
Option 4.	Performance Study—major instrument, (8 credits); Music 542 (2 credits); Music Lab—instrumental, (2 credits).
Option 5.	Music 542 (2 credits); Performance Study—brass, (1 credit); Performance Study—woodwind, (1 credit), or Techniques and Methods.
Option 6.	Performance Study—major instrument (2 credits); Music Laboratory (2 credits); Techniques and Methods (4 credits); Music Education 500.

Sophomore Year

All Options: General Education Requirements—selected social science (2 courses), selected humanities (non-music) (2 courses); Music 571-572, 573-574.

Option 1. Music 542 (8 credits).

Option 2. Music 544 (8 credits).

Option 3. Music 541 (8 credits); Music 542 (2 credits); Music Laboratory—choral, (2 credits).

Option 4. Performance Study—major instrument, (8 credits); Music 524 (2 credits); Music Lab—instrumental, (2 credits).

Option 5. Music 542 (2 credits); Music 501-502; Performance Study—strings, (1 credit), or Techniques and Methods.

Option 6. Performance Study—major instrument (2 credits); Music Laboratory (2 credits); Techniques and Methods (4 credits); Education 500 in place of one social science.

Junior Year

Options 1-5: General Education Requirements—Foreign language recommended (2 courses).

Option 1. Music 542 (8 credits); Music 501-502; Music 771-772; Music 455 (455).

Option 2. Music 544 (8 credits); Music 501-502; Music 771-772; Music Education 540 and 741.

Option 3. Music 541 (8 credits); Music 542 (2 credits); Music 501-502; a second foreign language—German, French or Italian (8 credits); Music Laboratory—choral and/or opera workshop, (4 credits).

Option 4. Performance Study—major instrument, (8 credits); Music 501-502; Music 551-552; Ensemble, (2 credits); Music Laboratory—instrumental, (2 credits).

Option 5. Music 771-772; Music 775-776; Music 779; Music 781; Music 542 (2 credits).

Option 6. Music 501-502; Music 551-552; Music 779; Performance Study—major instrument (3 credits); Music Laboratory (3 credits); Education 700; Education 701; one social science.

Senior Year

Option 1. Music 542 (8 credits); Music 455 (455); Music 735; two 4-credit courses elected in advanced theory and literature; two 4-credit courses elected outside the Department of Music.

Option 2. Music 544 (8 credits); two 4-credit courses in liturgical music, organ literature, repertoire and hymnology; two 4-credit courses in music literature and/or advanced theory; two 4-credit courses elected outside the Department of Music.

Option 3. Music 541 (8 credits); Music 542 (2 credits); two 4-credit courses in music literature and/or advanced theory; Music Laboratory—choral, ensemble, and/or opera workshop, (4 credits).

Option 4. Performance Study—major instrument, (8 credits); two 4-credit courses in music literature and/or advanced theory; two 4-credit courses elected outside the Department of Music; Music Laboratory—instrumental, (2 credits); ensemble, (2 credits).

Option 5. Music 773 (2 credits); Music 777-778; Music 542 (2 credits); two 4-credit courses in music literature; two 4-credit courses elected outside the Department of Music.

Option 6. Music Education 787-788; Music Education 791-792; Education 705; Education 694; Performance Study—major instrument (1 credit); Music Laboratory (1 credit); General Education Requirement (2 courses, foreign language recommended).

All students are responsible for adding electives as needed to total a minimum of 128 credits for graduation.

College of Life Sciences and Agriculture

Harry A. Keener, Dean
Avery E. Rich, Associate Dean
Emery C. Booska, Assistant to the Dean

Departments and Institute
Animal Sciences
Biochemistry
Botany and Plant Pathology
Entomology
Home Economics
Plant Science
Institute of Natural and Environmental Resources

Degrees, Majors, and Specializations

Bachelor of Arts
Botany and Plant Pathology
Entomology

Bachelor of Science
Agricultural Engineering*
Animal Sciences
- Animal Science
- Dairy Science
- Poultry Science
- Preveterinary Medicine

Biochemistry
Biology
Botany and Plant Pathology
Entomology
General Studies
Home Economics
Occupational Education
Plant Science
Institute of Natural and Environmental Resources
- Community Development
- Environmental Conservation
- Forest Resources (B.S. in Forestry)
- Hydrology
- Resource Economics
- Soil Science
- Wildlife Management

Bachelor of Science in Forestry

*First two years at the University of New Hampshire, second two at the University of Maine.

General Information

Purposes and Programs

The objectives of the College of Life Sciences and Agriculture are to give students a fundamental education in the biological, physical, and social sciences and to introduce them to the arts and humanities. In addition, specific technical courses are provided in the student's interests and major.

The College offers three undergraduate degrees: the Bachelor of Arts, the Bachelor of Science, and the Bachelor of Science in Forestry.

Advisory System A member of the faculty closely related to the student's area of interest is appointed as an adviser to assist the student in planning his or her academic program.

The student may select a major upon entering the College or may wait until registration for the sophomore year.

Honors Program The College of Life Sciences and Agriculture, through its various departments, offers the superior student the opportunity to participate in an honors program which is individually designed to provide added intellectual incentives and opportunities. Participation in the honors program is by invitation of a faculty member with the approval of the Department concerned and the Dean of the College. It is limited to those students entering the sophomore or junior year with at least a 3.0 grade point average. The recommending faculty member, his or her department chairperson, and the Dean will constitute the student's academic advisory committee. This committee and the student will decide upon a suitable academic program. Departmental and College course requirements may be waived for students in the program. The student will complete the same number of credits to graduate as other students in the department.

Dual-Degree Program: See page 18 for requirements.
Student Designed Major: See page 81 for requirements.
Minor Option: See page 18 for requirements.

Bachelor of Arts

Students majoring in Botany and Plant Pathology or in Entomology may elect to earn either a Bachelor of Arts degree or a Bachelor of Science degree. The degree requirements for the Bachelor of Arts in Life Sciences and Agriculture are the same as for a Bachelor of Science plus the addition of a foreign language requirement (see page 17).

Bachelor of Science

Many professional careers are open for graduates of the College. There are opportunities for people trained in resource development and conservation in addition to positions serving in agricultural industries. Emerging countries throughout the world are asking for assistance in all phases of agriculture, including home economics and forestry. In all departments students may prepare for further graduate work in their respective fields of interest.

Following are additional examples of employment agencies and industries and the careers which they offer.

The agricultural industries, food processors, and banks employ graduates as price analysts and managers.

State planning and recreation agencies, soil conservation services, the cooperative extension services, and private research firms employ rural and urban planners, hydrologists, conservation experts, resource development economists, nursery planners, and landscape gardeners.

The Peace Corps and the Foreign Agriculture Service hire farm production experts, soil and water managers, market analysts, agricultural engineers, teachers, plant and animal breeders, and nutrition specialists.

The federal government and state agencies, universities, health services, and private foundations employ biochemists, geneticists, animal nutrition specialists, plant and animal pathologists and physiologists, veterinarians, foresters, home economists, and entomologists.

Academic Requirements

For the Bachelor of Science degree a total of 128 credits are required. In addition the student must complete the University

academic requirements found on page 16, obtain a written recommendation for graduation from the adviser and department chairperson, and achieve a 2.0 cumulative average for all courses taken at the University of New Hampshire.

Agricultural Engineering

Under this accredited program, a student completes the first two years of coursework at the University of New Hampshire, then transfers to the University of Maine for the junior and senior requirements, receiving a Bachelor of Science degree. Inquiries about the program should be addressed to the Associate Dean of the College of Life Sciences and Agriculture.

Animal Sciences

The animal sciences courses are offered to provide students fundamental scientific training in such specialized areas as genetics, physiology, nutrition, animal hygiene, processing, pathology, and management. The student also has an opportunity to further concentrate studies in the fields of animal, dairy, or poultry science; light horses; pre-veterinary medicine; or animal biology.

Outstanding graduates are qualified to pursue advanced study in preparation for college teaching, research, and responsible technical positions in industry and federal and state agencies. Students interested in production and processing can receive training as production managers, for positions in the feed or equipment industries, marketing organizations, animal breeding associations, sales and service work in allied industries, and other areas of the diversified animal industry.

The department maintains Morgan and Thoroughbred horses for all phases of class work including riding. Herds of Hereford and Angus cattle; Yorkshire swine; and a flock of Dorset sheep are maintained in a new livestock facility.

The nationally recognized dairy herd, consisting of registered Ayrshire, Guernsey, Holstein, and Jersey animals, is housed in a new dairy barn. The Ritzman Animal Nutrition Laboratory includes bomb calorimeters, metabolism stalls for digestion studies, respiration chambers for heat production measurements, and other facilities used in nutrition teaching and research with both farm and laboratory animals.

Completed new poultry farm facilities are for instruction and research and include laboratories for both teaching and research in poultry genetics, nutrition, diseases, and management.

Laboratory facilities, including such modern equipment as ultra centrifuge, amino acid analyzer, gas chromatograph, and electron microscope are available in Kendall Hall to provide the latest scientific training in the field of animal hygiene. Kendall Hall is an entirely new facility with five floors devoted to offices, classrooms, and laboratories for the Animal Sciences Department.

The department works closely with the New Hampshire animal industry and frequent class trips are made to leading farms, industrial concerns, processing plants, etc. where opportunities are presented for viewing industry in action.

Students who contemplate veterinary medicine as a career should confer early with the adviser to preveterinary-medicine students. It should be noted that all veterinary colleges give first preference for admission to applicants from their respective states. Out-of-state students who are admitted must show above average scholastic ability. It is desirable that applicants to colleges of veterinary medicine have some farm experience; and, in fact, it is a prerequisite for admission to some.

Biochemistry

Biochemistry is the study of the chemistry of living things and life-processes. The program in biochemistry provides a fundamental education in chemistry and the biological sciences and includes basic courses in physics and mathematics.

Curriculum options are offered to meet the educational requirements of students with differing professional goals.

Biochemistry Curriculum A provides intensive preparation in chemistry and biochemistry and basic courses in botany, zoology, microbiology, and genetics. This curriculum is recommended for students preparing for graduate study or for admission into professional schools of medicine, dentistry, or pharmacy. Students entering the curriculum should register for Chemistry 405-406, Mathematics 425-426, Botany 411, and Zoology 412 in the freshman year.

Biochemistry Curriculum B provides a fundamental education in chemistry and the biological sciences with enrichment in biochemical specialties including medical, analytical, marine, or food biochemistry. It provides a strong educational background for technical employment in research and service programs of universities, medical schools, hospitals, research institutes, and industrial or government laboratories. Students entering this curriculum should register for Chemistry 403-404, Biochemistry 402, Botany 411, and Zoology 412 in the freshman year.

Students interested in a biochemistry major are advised to consult with the department chairperson as early as possible to assure the most effective curricular planning.

Biology

The Interdepartmental Biology major is described in the Preprofessional, Interdisciplinary, and Experimental Programs Chapter, page 82.

Botany and Plant Pathology

The Botany and Plant Pathology program is designed to explore the fundamental nature of plants. Botany graduates with suitable undergraduate backgrounds may enter the field of secondary education or become research technicians. Those students who have an interest in University teaching and/or research, governmental research, and certain kinds of industrial positions should expect to complete graduate education in the field.

The principal areas of concentration in the Department are: 1) plant physiology, 2) cell biology, 3) ecology, 4) phycology, 5) biological oceanography, 6) plant pathology, 7) systematic botany, 8) plant anatomy and morphology, 9) mycology, and 10) morphogenesis.

Two Botany and Plant Pathology degrees are offered: Bachelor of Science and Bachelor of Arts. All undergraduate Botany majors are required to take the following core of Botany courses: 411, General Botany, or 412, Introductory Botany (or equivalent); 503, The Plant World; 566, Systematic Botany; 606, Plant Physiology; and 758, Plant Anatomy, or 762, Morphology of the Vascular Plants. Also required are two Botany electives, Zoo 412, and one year of chemistry. Majors must maintain a grade of C- or better with an average of 2.0 in required courses. Beyond that, the program of each individual student is selected by the student and adviser to meet particular needs.

Students interested in becoming Botany and Plant Pathology majors are invited to discuss the matter with Professor A. Linn Bogle.

Entomology

Entomology offers courses for students who wish to specialize in the study of insect life, insect control, and insects in relation to man. There are opportunities for employment in a number of federal and state agencies, in public institutions, and with commercial and industrial firms. Many opportunities exist in the areas of crop protection, forestry, conservation, and in public health.

Students are given a fundamental training in entomology and related fields. Qualified students planning a professional career in entomology are encouraged to undertake graduate study. Those who wish to specialize in chemical control of insects will be expected to take courses in mathematics and chemistry.

Students who major in entomology are expected to complete successfully courses offered by the department, to a total of 32 semester credits. Courses in other departments may be counted with the consent of the major supervisor.

A student may earn either a Bachelor of Science or Bachelor of Arts degree in Entomology.

Those contemplating a career in entomology are advised to consult with the chairperson of the Entomology Department.

General Studies

This curriculum is offered for the student who wishes to secure a broad non-specialized background in several areas related to the College without specializing in any particular department. After completing the University General Education requirements the student may select courses to fit specialized or general interests. A student transferring from one major to another may wish to register in the General Studies curriculum until educational objectives

have been more clearly defined, or a student may complete the work for the Bachelor of Science degree in the General Studies curriculum provided that the student has a broad interest in the life sciences.

In addition to meeting the General Education requirements, it is expected that a student would earn a total of at least 32 credits in Life Sciences and Agriculture courses. Courses in closely related fields may be substituted with permission of the adviser. Interested students should consult with the associate dean of the College of Life Sciences and Agriculture.

Home Economics

The objectives of the program in home economics are to provide, through the facilities of the University, a broad general education in the social and natural sciences, the humanities, and the arts, and to provide specialized instruction based on these disciplines as preparation for professional careers in which the interests and well-being of the individual, the consumer, and the family are paramount.

The department provides professional preparation through five programs open to men and women: 1) secondary school education, 2) pre-school education, 3) family services, 4) consumer studies, 5) human nutrition and dietetics.

The department has been approved by the New Hampshire State Board of Education for the preparation of nursery, kindergarten, and secondary school teachers in vocational home economics and family-life programs. Requirements for some professional programs make it advisable for the student to specify an option as soon as possible, by the sophomore year at the latest.

A candidate for the degree of Bachelor of Science completes 32 courses or a minimum of 128 credits with an average of C or better, distributed as follows: University General Education requirements, 16 courses or 64 credits; professional or specialized education requirements, 16 courses or 64 credits. The latter must include a minimum of nine courses or 36 credits in home economics. Each undergraduate is required to take a minimum of four credits from each of the three major subject matter areas, i.e. Food and Nutrition, Family-Child, and Consumer Studies, offered by the Home Economics department. Upon declaring his or her major interest, the student, in consultation with the adviser, will then select the remaining six courses (24 credits) from among those offered in the department which relate to his or her particular field of interest. Also included must be a minimum of three courses or 12 credits in one of the social sciences or natural sciences numbered 500-level or above, and four courses or 16 credits of professional preparation (to be decided upon by the student in consultation with the adviser). These final four courses may help the student meet certification standards for secondary school teaching, pre-school teaching, ADA requirements for a dietetic internship, or other objectives.

Students wishing to major in the home economics department are advised to consult with the department chairperson as early as possible. Further information about specific programs may be obtained by contacting the Home Economics Department.

Institute of Natural and Environmental Resources

Community Development

The Community Development program deals with broad aspects of community problem resolution including economic, social, political, and technical matters. Communities are viewed as systems subject to meaningful analysis. Emphasis is placed on the community development process of helping the people in the community learn how to work together, organize their efforts, and analyze community problems in democratic, decision-making framework. The curriculum takes an interdisciplinary approach, and includes field experience as a vital component, along with classroom and independent study.

The core courses in the curriculum provide the student with the basic community development tools. Flexibility is provided through electives that permit the student to specialize and develop a strong minor in areas such as conservation, planning, education, administration, pollution and waste disposal, natural resource management, or resource economics. Opportunity is provided for directed field experience.

While this program is suitable for preparing citizens for more effective leadership in their community, employment opportunities are available in the United States, Canada, and in emerging na-

tions. Many federal and local agencies are now undertaking revenue sharing and community assistance programs and need personnel who are trained to apply the arts and sciences to the problems of communities. Similarly, many private and local groups are concerned with community planning and development.

Students interested in a Community Development major or minor may consult with the program coordinator, Dr. Edmund F. Jansen, Jr., James Hall, or with the Director of the Institute.

Required Courses

INER	401	Natural and Human Resources in New England
Res. Econ.	507	Introduction to Community Development
Res. Econ.	508	Applied Community Development
Res. Econ.	795 or 796	Independent investigation in field analysis of a specific problem in a community in the region

At Least Five of the Following:

Admin.	712	Organizational Change
Admin.	713	Interpersonal and Group Dynamics
Biol.	541	General Ecology
Civ. Engr.	611	Environmental Planning Concepts
INER	528	Applied Statistics
INER	702	Natural Resources Policy
Res. Econ.	705	Structure and Planned Change in Non-Urban Communities
Res. Econ.	717	Laws of Community and Regional Planning
Soc.	500	Social Psychology
Soc.	560	Rural-Urban Sociology
INER	709	Soil Interpretation and Community Planning

Courses to Satisfy General Education Requirements*

Biological and Physical Sciences and Mathematics:

Biol.	401 or	Human Biology: Elementary Physiology
Botany	411	General Botany
Math	415 or	Mathematics of Business and Economics
	420	Fundamental Mathematics

Two Additional Courses Selected by Student

Arts, Humanities, and Social Sciences:

Res. Econ.	411	Introduction to Resource Economics
Res. Econ.	506 or	Population, Food, and Resource Use in Developing Countries
Res. Econ.	606	Land Use Economics
Pol. Sci.	631	Local Government and Politics
Soc.	400	Introductory Sociology

Two Additional Courses Selected by Student

Outside Major Department:

Eng.	401	Freshman English
Eng.	501	Expository Writing
Speech	403	Communications II

Three Additional Courses Selected by Student

General Electives

At least 7 courses (28 semester hours) selected by student

*General education requirements are currently under review and course list will be available by Registration Day, fall 1976.

Environmental Conservation

This program is intended to give a broad background for understanding environmental and resource problems and their solutions. Man's economic activity within our biological ecosystems requires understanding of both subject-matter areas. Development of policies and planning is essential to resolving environmental problems.

Students must develop an option related to career goals. The option consists of eight courses selected with the assistance of the faculty adviser from the offerings of the University. Options center on a variety of conservation-related areas, such as land-use planning, ecological education, pollution control, writing on natural resources, etc. In addition, a student must complete the 11 courses listed below, which make up the core of the environmental conservation program.

A minor of five courses in Environmental Conservation is available for students majoring in other areas.

Students should plan to work for a master's degree if they wish to be professional conservationists. The undergraduate degree offers an education in environmental conservation with the opportunity for specialization or generalization in related fields.

All students must complete the University General Education requirements. Students are further urged to take courses which will develop their writing and speaking skills.

The following 11 courses are required of all majors:

1. INER 401, Natural and Human Resources of New England
2. Bot. 411, General Botany
3. Zool. 412, Principles of Zoology
4. and 5. Ecology electives: two of the following: Biol. 541, General Ecology; Bot. 741, Ecosystem Analysis; Bot. 742, Physiological Ecology; Forest Res. 527, Silvics; Forest Res. 634, Wildlife Ecology; Forest Res. 672, Ecological Energetics
6. Res. Econ. 411, Introduction to Resource Economics
7. An advanced course in the economics of resources
8. INER 635, Contemporary Conservation Issues
9. INER 702, Natural Resources Policy
10. Soil and Water Sci. 504, Fresh Water Resources
11. INER 637, Senior practicum: 4 credits. This practicum will be an independent project involving field work on an actual conservation activity during the senior year. A written report will be required. The project may be developed with any faculty member in the Institute of Natural and Environmental Resources.

Students interested in a major or minor may consult with the Program Coordinator, Dr. John Carroll, James Hall, or with the Director of the Institute.

Forest Resources

The objectives of this program are to combine a basic education with a forestry technical education to meet the needs of the professional forester. The Forest Resources program is accredited by the Society of American Foresters.

Graduates are employed in a variety of forest-land management and administrative positions. Some graduates work with natural resource protection, utilization, and the development of environmental quality. Others are employed in the production of raw materials, while still others concentrate on wildlife, grazing, watershed, and recreation.

Managerial and administrative skills are required of most forestry graduates. The program gives a strong foundation in both biological knowledge and managerial skills, with elective freedom for the student to cultivate special abilities and interests. The curriculum leads many students into graduate studies.

Students majoring in Forest Resources complete 136 credit-hours for the degree of Bachelor of Science in Forestry. The University General Education requirements are currently under review and may be met by taking the required courses below and by choosing electives from the following: four courses in arts, humanities, or social sciences; and four courses other than those listed under Forest Resources.

In addition to the normal University fees and tuition, Forest Resources students are required to meet transportation and meal charges in connection with regularly planned field sessions.

		Fall	Spring
Freshman Year			
INER 401	Nat. and Hum. Res. of N.E.		2
For. Res. 425, 426	Dendrology; Wood Technology	4	4
English 401	Freshman English	4	
Botany 411	General Botany	4	
Math 425	Calculus I	4	
Economics 401	Principles of Economics		4
Advanced English	Writing or Speaking Development		4
Elective		18	16
Sophomore Year			
Science Elective (one semester)	Chem. 403, Earth Sci. 401, or Physics 401	4 or	4
Elective	Forest Pathology (Bot. 753)* or Forest Entomology (Ent. 506)	4 or	4
For. Res. 527	Silvics	4	
INER 528	Applied Statistics		4
S&W 501	Soils and the Environment	4	
For. Res. 544	Forest Economics		4
Computational Elective	Math 410 or INER 511	2	
Electives		4-8	4-8
		18	16
Spring Field Session			
For. Res. 542	Forestland Surveying		2
Junior Year			
For. Res. 629	Silviculture	4	
For. Res. 644	Forest Mensuration		4
For. Res. 660	Forest Protection		2
Electives		12	12
		16	18

Senior Year			
For. Res. 745, 798	Forest Management, Forest Resources Seminar	4	4
For. Res. 754	Wood Products Manufacturing and Marketing		4
Electives		12	8
		16	16

*Bot. 753 requires junior class standing.

Prior to the junior year, each student must choose a single area of concentration from the five-course options listed below, and must elect five courses with that option.

Forest Management Option: One course at the 500 level or above in accounting, management, or administration in WSBE: F.R. 753, Operations Control and Analysis; and three additional courses in advanced forestry, wildlife, hydrology, soils, resource management, or administration.

Forest Science Option: Chem. 404, General Chemistry; Biochem. 501, Biological Chemistry, and Pl. Sci. 606, Plant Physiology, or Chem. 651-652, Organic Chemistry; and two courses in advanced Plant Science, Botany, or Entomology.

Wood Science Option: Chem. 404, General Chemistry; Math 426, Calculus II; two courses in For. Res. 695 (Sec. 3), Investigations in Forest Utilization; and one course in advanced Mathematics, Science, or Engineering.

Quantitative Science Option: Math 426, Calculus II; Math 527, Differential Equations, or Math 528, Multidimensional Calculus; Math 640, Linear Algebra; a course in probability or statistics; and a course in advanced mathematics, statistics, or computer science.

Students interested in the Forest Resources program may consult with the program coordinator, Dr. Harold Hocker, James Hall, or with the Institute Director.

Resource Economics

This program offers training in resource economics, including public resource policy, resource management, conservation economics, and regional economics. Training is also available in agricultural economics, including farm management, food marketing, agricultural policy, and world food supplies.

The student in resource economics is trained primarily in the science of economics and its use in problem-solving by individuals, households, business firms, communities, and administrators of governmental agencies. In addition, the student satisfies General Education requirements leading to a broad university education. Those majors who are interested in the economic or business aspects of agriculture will be expected to take courses in the departments of Animal Sciences and Plant Science.

Students majoring in the social sciences and Life Sciences and Agriculture departments of the University may find it to their advantage to elect courses or a minor in resource economics. In this manner their basic training can be supplemented in a specific area of interest, such as: farm management and agricultural marketing for agricultural majors, or resource development and natural-resource policy for social science majors.

Students who major in resource economics are qualified for a wide variety of opportunities upon graduation. There is currently a strong demand by private business, public institutions, and government agencies for specialists trained in agricultural, fisheries, and forestry marketing; conservation resource development, community development, and land-use policy; extension work; resident teaching; and farm management. In many cases the students may wish to improve their qualifications by pursuing more specialized graduate studies in one or more of the above areas.

Required Courses

1. All of the following:

Eng. 401	Freshman English
Soc. 400 or	Introductory Sociology
Pol. Sci. 401	Introduction to Political Science
Speech 403	Public Speaking
Admin. 502	Financial Accounting
Bot. 411	General Botany*
Zool. 412	Principles of Zoology*
S&W 501	Introductory Soils*
or 504	Fresh Water Resources*
INER 401	Natural and Human Resources in New England
Res. Econ. 411	Introduction to Resource Economics
Math 420 or 425	Fundamental Mathematics or Calculus
Econ. 605	Intermediate Economic Analysis
Econ. 611	National Income Analysis
INER 528	Applied Statistics I

2. At least six of the following:

Res. Econ. 501	Agricultural and Natural Resource Product Marketing
Res. Econ. 504	Management of Farm and Related Resource Based Business
Res. Econ. 506	Population, Food and Resource Use in Developing Countries
Res. Econ. 507	Introduction to Community Problems
Res. Econ. 606	Land Use Economics
Res. Econ. 612	Marine Resource Economics
Res. Econ. 676	Economics of Water Use
Res. Econ. 706	Economics of Resource Development
Res. Econ. 756	Regional Economic Analysis
INER 701	Statistical Methods

*or equivalent to satisfy General Education Biological Science requirement, currently under review.

Students interested in a major or minor in this program may consult with the program coordinator, Dr. Richard Andrews, James Hall, or with the Institute Director.

Soil and Water Sciences

The subject matter of this program relates the physical sciences to the environment. It includes knowledge of the outermost layer of the earth's crust and that portion of the hydrologic cycle pertaining to the fate of water falling on the earth's surface. Knowledge concerning soil and water is important to persons working in the plant sciences, geology, geography, meterology, natural resource management and pollution control, and certain aspects of engineering. Students interested in soil and water science must select one of the two majors described below by the end of the sophomore year.

Soil Science

This major helps the student develop an understanding of the nature and properties of soils as well as their importance to modern society. It includes the study of the chemical and physical properties of soils, their formation, classification, conservation, and management. Soils are evaluated as a resource in urban and rural community planning.

Listed below are the core courses expected of majors. Electives permit freedom to tailor training to a student's specific interests:

Chem. 403, 404 General	INER 401 Nat. & Hum. Res. of N.E.
Chem. 517 Quantitative	S&WS 501 Soils and the Environment
Physics 407, 408 General	S&WS 502 Intro. Soil-Plant Rel.
Math 410 Digital Computer	S&WS 602 Chemical Analysis of Soil
Math 425, 426 Calculus	S&WS 702 Chemistry of Soils
Earth Sci. 401 Principles	S&WS 704 Soil Classification
Earth Sci. 662 Glacial	S&WS 795, 796 Independent Work
Botany 412 General	Micro 503 General Microbiology
Botany 606 Plant Physiol.	Micro 708 Microbial Biogeochemistry

Students interested in the soil science major should consult with Professor Nobel Peterson or with the Institute Director.

Hydrology

This is the science underlying development and control of water resources on and beneath the earth's surface. Because water is a basic requirement of life, it has social, economic, and political significance throughout the world. As the population of the world grows and as industrial, recreational, agricultural, and residential needs for water increase, greater emphasis will be placed on the study and understanding of problems associated with water resources.

Core courses expected of majors are listed below:

Chem. 403, 404 General	Botany 411 or 412 General; or Pl. Sci. 421
Physics 407, 408 General	C.E. 642 Fluid Mechanics
Math 410 Digital Computer	S&WS 501 Soils and the Environment
Math 425, 426 Calculus	S&WS 603 S&W Engineering
Earth Sci. 401, 402 Principles	S&WS 705 Principles of Hydrology
Earth Sci. 561 Geomorphology	S&WS 710 Ground Water Hydrology
INER 757-Remote Sensing	S&WS 795, 796 Independent Work

Students interested in the hydrology program may consult with the program coordinator, Professor Gordon Byers, Pettee Hall, or with the Institute Director.

Wildlife Management

This curriculum is for students whose interest is in the understanding, production, management, and utilization of game and other forms of wildlife. It is designed to provide a knowledge of wildlife species and of the total forest and field environment of which they are a part. It prepares the student for work with public and private agencies in wildlife management and ecology, and is a base for graduate study, needed for research and teaching.

The degree earned is a Bachelor of Science with a major in wildlife management. The program is administered in the Institute of Natural and Environmental Resources and is a cooperative program with the departments of Animal Sciences and Zoology.

Field work is carried out during the academic year on wildlife areas near the campus. In June each year, a two-week session is held for all students who have completed the sophomore year. There is no additional summer camp. In addition to the normal University fees and tuition, students are required to meet transportation and meal charges in connection with regularly planned field sessions. Majors are encouraged to obtain summer employment related to their career objective.

Students majoring in wildlife management are required to complete 132 credits for the bachelor's degree. In completing the curriculum which follows, the student will meet the University General Education requirements. These requirements should be met by choosing electives as follows: four courses in arts, humanities, or social sciences; and four courses from the other General Education requirements. Two electives should be chosen from additional resource-oriented courses such as: Forest Resources: 544, Forest Economics; 629, Silviculture; 644, Forest Biometrics; 672, Ecological Energetics; 745, Forest Management; Soil and Water Science: 501, Introductory Soils; 502, Soil-Plant Relationships; 504, Fresh Water Resources; and INER: 702, Natural Resource Policy; 712, Sampling Techniques; 797, Forest Recreation Seminar.

		Fall	Spring
Freshman Year			
INER 401	Natural and Human Resources of New England	2	
Bot. 411	General Botany	4	
Zool. 412	Principles of Zoology		4
For. Res. 425	Dendrology	4	
Math 420 or	Fundamental Mathematics		4
Math 425	Calculus		
Engl. 401	Freshman English	4	
Res. Econ. 411	Introd. to Resource Econ.		4
Electives		4	4
		18	16
Sophomore Year			
An. Sci. 501	Animal Anatomy and Physiology	4	
INER 635	Contemporary Conservation Issues	4	
Chem. 403-404	General Chemistry	4	4
INER 528	Applied Statistics I		4
Zool. 542	Orinthology		4
Electives		4	4
		16	16
Spring Field Session (June)			
For. Res. 542	Forestland Surveying	2	
Junior Year			
Biochem. 501	Biological Chemistry	4	
Zool. 712	Mammalogy	4	
Biol. 541	Principles of Ecology	4	
For. Res. 634	Wildlife Ecology		4
An. Sci. 614	Disease and Parasites of Wildlife		4
Pol. Sci. 401 or 402	Introduction to Political Sci.		4
Math 403 or	Computer Programming	2	
INER 511	Computational Methods in Natural Resources	2	
Electives		4	4
		18	16
Senior Year			
For. Res. 737, 738	Game Management I and II	4	4
Zool. 711	Natural History of Cold-blooded Vertebrates	4	
Zool. 772	Fishery Biology		4
Electives		8	8
		16	16

Students interested in the Wildlife Management program may consult with the program coordinator, or with the INER Director.

Occupational Education

The Occupational Education curriculum provides professional preparation for teachers of Vocational-Technical Education and County Cooperative Extension personnel. Flexibility is maintained among individual programs with up to 30 credits being allowed for qualified students under the Occupational Competency Testing and Evaluation option.

Career options are varied with graduates teaching in nearly all areas of vocational-technical education and career education. Students also prepare for adult education positions through participation in field experiences in addition to course work.

Students desiring to major or minor in this program should consult with the program chairperson Professor W.H. Annis.

Plant Science

Students interested in plants and their use for food, feed, fiber, recreation, or ornamental purposes may take a major or minor in plant science. A core curriculum of physical and biological sciences is required. Selected courses then relate these sciences to the individual's specific area of interest. Two curriculum options, the *Science* option and the *General* option, are offered to plant science majors. The following courses or their equivalents are required for these options:

		Sci. Option	Gen. Option
Pl.Sc. 421	Concepts of Pl. Growth	x	x
Pl.Sc. 522	Environ & Pl. Response	x	x
Pl.Sc. or Zool. 604	Principles of Genetics	x	x
Pl.Sc. 606	Plant Physiology	x	x
Pl.Sc. 535, 695, or 678	Elect. in Crop Prod.		x
Pl.Sc. 795 or 796	Elect. in Special Topics	x	
Math 405 or 425-426	Functions or Calculus	x	
Phys. 401,402	General Physics	x	
Chem 403, 404,545	Inorganic & Org. Chem.	x	x
Micro. 503	General Microbiology	x	
Ent. 402	Introd. Entomology	x	x
S.&W. 501	Soils & the Environ.	x	x
Bot. 411 or 503	General Botany	x	x
Bot. 751	Plant Pathology	x	x
INER 528 or 701	Statistics	x	

Because of the diversity of employment possibilities, the General option curriculum is flexible. Minor programs in administration, economics, English (journalism), parks and recreation, or occupational education are possible to accommodate specialized interests and complement fundamental requirements. Students will find opportunities in management of farms, greenhouses, golf courses, or nurseries; teaching; journalism; park or highway planning commissions; sales or brokerage aspects of wholesale and retail marketing; and food and feed processing firms. Students pursue the Science option to prepare for graduate study and careers in research or teaching.

Students interested in a plant science major or minor may consult with the department chairperson Professor L. C. Peirce.

College of Engineering and Physical Sciences

Richard S. Davis, Dean
Tenho S. Kauppinen, Assistant Dean
Donald A. Moore, Assistant to the Dean,
Director of Center for Industrial and
Institutional Development

Departments
Chemical Engineering
Chemistry
Civil Engineering
Earth Sciences
Electrical Engineering
Mathematics
Mechanical Engineering
Physics

Programs of Study
Bachelor of Science
Chemical Engineering
Chemistry
Civil Engineering
Electrical Engineering
Geology
Mathematics
Mathematics Education
Mathematics—Interdiciplinary
Mechanical Engineering
Physics

Bachelor of Arts
Chemistry
Chemistry and Physics Teaching
Earth Science Teaching
Geology
Mathematics
Physics
Science

Bachelor of Engineering Technology
Electrical Engineering Technology
Mechanical Engineering Technology

General Information

The College of Engineering and Physical Sciences seeks to provide an optimal opportunity for students to achieve educational objectives appropriate to their interests in engineering, mathematics, and the physical sciences. The College offers a vigorous professional education in each of its eight primary disciplines leading to the Bachelor of Science, and a broad liberal education coupled with a major in mathematics and each of the three physical sciences leading to the Bachelor of Arts. All programs include an opportunity for study in the arts humanitites, and social sciences.

The key to an undergraduate program in the College is flexibility with a strong emphasis on personal and individualized education. In addition to specific programs a number of sub-options are available. Special programs can be developed to meet the specific interests of individual students.

Mathematics 425-426 or the equivalent in transfer credits or advanced placement approved by the Mathematics Department is required by all departments of the College for their majors.

The Bachelor of Science

The programs leading to the Bachelor of Science degree, offered in each of the departments of the College, emphasize the preparation of students for a professional career and continuing or graduate education.

The degree requirements for the Bachelor of Science include the University General Education Requirements page 16 and the specific departmental requirements for graduation. A minimum grade-point average of 2.0 must be achieved. Graduation credit requirements established by the departments range from 128-131. Since there is a core of courses which are similar in each curriculum, it is possible for a student to change the field of study during the sophomore year with little effect on the time required for graduation.

The Bachelor of Arts Program

Programs leading to a Bachelor of Arts degree are offered in Chemistry, Geology, Mathematics, and Physics. These programs provide a broad liberal education along with a major in one of these physical sciences or mathematics. Students interested in science, but undecided about the field, may enter the College as a science major. The University degree requirements for the Bachelor of Arts degree are on page 17.

Bachelor of Engineering Technology

The Bachelor of Engineering Technology Program provides an opportunity for students with associate degrees in appropriate disciplines from accredited technical institutes to pursue a college degree in the area of engineering technology. Curricula in electrical and mechanical engineering technology are offered. The program has a two-plus-two type of structure whereby qualified students may completely transfer two years of credit as a result of their having an associate degree. Thus, if they are successful, they may complete the B.E.T. requirements in two years.

5 Year Program: B.S.-M.B.A.

The College of Engineering and Physical Sciences and the Whittemore School of Business and Economics offer a combined program leading to a Bachelor of Science in Chemical Engineering, Civil Engineering, Electrical Engineering, or Mechanical Engineering and a Master of Business Administration in five years rather than the normal six years. In order to accomplish this, students admitted to the program may have to take more than 16 credits per semester in several semesters (though no more than five courses or 20 credits). Provision has been made to count 12-24 credits towards both undergraduate and graduate degree requirements. All other University and departmental requirements for each degree must otherwise be met.

The program first "pre-admits" qualified students into two MBA courses at the end of the sophomore year. The pre-admission program is carried out jointly by representatives from the Whittemore School and the College of Engineering and Physical Sciences. Students should submit a formal application to the Graduate School (in the second semester of the junior year) for admission to the MBA program and will be judged by academic standards with special emphasis on maturity and experience.

Most of the fourth year is occupied by core MBA courses while the fifth year is used for MBA electives (some of which might be

taken in the undergraduate major department) and for completing all requirements for the undergraduate degree. The MBA will be granted only if the bachelor's degree requirements are successfully completed.

The details of each student's curriculum are worked out jointly with his or her undergraduate adviser and with an adviser for the MBA program.

Interdisciplinary Minors

Interdisciplinary minors have been developed in ocean engineering, oceanography, bioelectronics engineering, and environmental engineering. These programs will enable students to obtain experience in the specialized area and to retain identification with their major professional area.

Ocean Engineering The ocean engineering minor provides for undergraduate students in Engineering to acquire a nucleus of knowledge about engineering pertaining to the ocean and the coastal zone.

A student must satisfactorily complete five courses from the following list: Earth Sci. 501—Introduction to Oceanography; Earth Sci. 752—Chemical Oceanography; Earth Sci. 758—Introduction to Physical Oceanography; Earth Sci. 759—Geological Oceanography; E.E. 781—Ocean Instrumentation; E.E. 785—Underwater Acoustics; M.E. 737—Ocean Mechanics I; M.E. 738—Ocean Mechanics II; M.E. 751—Naval Architecture in Ocean Engineering; M.E. 752—Submersible Vehicle Systems Design; M.E. 757—Coastal Engineering and Processes; Tech 610—Introduction to Ocean Engineering; Tech 697—Ocean Projects. A student must take Earth Science 501, Technology 697, and three additional courses from the list, two of which must be engineering courses.

Students wishing to take the Ocean Engineering minor should indicate their interest to their department chairpersons no later than the beginning of the junior year. They will be assigned to their departmental ocean minor adviser who will assist in planning courses for the minor.

Biomedical Systems and Instrumentation The Biomedical Systems and Instrumentation minor encompasses the applications of engineering science and technology to the fields of medicine and biology. Biomedical engineers participate in the development of medical instrumentation, physiological sensors, prosthetic devices, orthopedic and surgical devices, biomaterials, patient safety, and the applications of computers to medical problems. Biomedical engineers may continue their studies at the graduate level and find employment in biomedical research, as a practically-oriented clinical engineer in a hospital or other clinical setting or with the medical device and instrument industry.

A student electing this interdisciplinary minor must select E.E. 783, Biomedical Engineering, and the Zoology 507-508 sequence (or its equivalent), and at least two other courses from the list below, in consultation with the adviser. Since many of these courses have prerequisites, students should begin the program during their sophomore year. During the final semester of study, application should be made to the Dean to have the Biomedical Systems and Instrumentation minor shown on their transcript.

Engineering: E.E. 783, Biomedical Engineering;* E.E. 784, Biomedical Instrumentation; E.E. 714, Minicomputer Applications Engineering; and with an appropriate choice of project and topic, E.E. 796, Special Topics in Electrical Engineering; 695 (E.E., M.E., C.E., Ch.E.), Engineering Projects; E.E. 757, Fundamentals of Communications; E.E. 758, Communication Systems; E.E. 782, Control Systems.

Sciences: Zool. 507-508, Human Anatomy and Physiology* (or Zool. 518, 527); Chem 651-652, Organic Chemistry (prerequisite: Chem. 404 or 405); Biochem. 656, Physiological Chemistry and Nutrition; P.E. 620, Physiology of Exercise; P.E. 652, Kinesiology.

It is suggested that Zool. 507-508 (Human Anatomy and Physiology) be selected during the sophomore year and that E.E. 783 (Biomedical Engineering) be taken in the senior year.

Oceanography The minor in Oceanography, available to all students in the University, consists of 20 semester hours with grades of C or better and no Pass/Fail courses. No more than eight major requirement credits may be used. A student may not elect minors in both ocean engineering and oceanography. All courses constituting the program shall be elected by the student in consultation with the oceanography minor adviser in the Earth Sciences department.

*required courses

Required courses include: 1) E.S. 501, Introduction to Oceanography, or E.S. 503, Introduction to Marine Science. 2) Two of the following courses: E.S. 752, Chemical Oceanography; E.S. 758, Physical Oceanography; E.S. 759, Geological Oceanography. 3) Any two of the following courses or a suitable substitute approved by the minor adviser. (It is advisable that at least one of the courses be in the area of the biological sciences.) Botany 525, 722, 723, 727, 728; Engineering—Tech. 610, Ch.E. 695, C.E. 695, E.E. 695, M.E. 695, M.E. 751, M.E. 757, M.E. 737; Microbiology 707, 708; Zoology: 618, 715, 724, 772, 774.

A student is encouraged to declare the intention to enter the program prior to the end of the junior year. During the final term, the student should apply to the Dean to have the minor shown on the transcript.

Environmental Engineering Minor The environmental engineering minor provides a comprehensive introduction to major areas of interest in environmental protection, namely air pollution and water pollution, through the three required courses. Further breadth in environmental engineering or depth in specific areas can be attained through the proper choice of elective courses.

The requirements for the minor include a total of at least 20 credits from the following: 1) Three required courses: Ch.E. 609, Fundamentals of Air Pollution and Its Control; C.E. 643, Introduction to Environmental Pollution Control; Ch.E. 772, Physicochemical Processes for Water and Air Quality Control, or C.E. 644, Water and Wastewater Engineering. 2) A minimum of two elective courses from the following list: Ch.E. 605, Mass Transfer and Stagewise Operations; Ch.E. 772, Physicochemical Processes for Water and Air Quality Control; C.E. 644, Water and Wastewater Engineering; C.E. 743, Environmental Sampling and Analysis; C.E. 746, Waste Water Treatment Plant Design; C.E. 747, Water Treatment Plant Design; C.E. 748, Solid Waste Disposal; E.E. 762, Illumination; E.E. 741, Fundamentals of Acoustics; M.E. 503, Thermodynamics; Microbiology 501, Public Health and Sanitation; 695, Engineering Projects (Ch.E., C.E., M.E., E.E.).

Choice of elective courses should be made in consultation with the adviser. Students normally start this program in the junior year and should declare their intention to enter the program as early as possible during the sophomore year. During the final term, the student should apply to the Dean to have the minor shown on the transcript.

Other Program Options

Second Major Option: See page 18 for requirements.
Dual Degree Programs: See page 18 for requirements.
Minor: See page 18 for requirements.
Student Designed Major: See page 81 for requirements.

Independent Study and Projects All departments within the College offer courses in independent study or in projects, the content varying with the current scientific and technological needs and with student and faculty interest.

Permission of the instructor and/or the department chairperson is required. (See the Course Descriptions for the independent study and projects courses and for specific requirements.) The initiative for an independent study course in any area rests with the student.

Special Provisions "The requirement of a given course in any prescribed curriculum may be waived by the faculty of a student's college. The student's petition must be approved by major advisor and the Dean of the College. This power will usually be delegated by the faculty to the Dean or to a committee." (Senate Rule 04.31(s). Waiver of Requirements in a Prescribed Curriculum.)

The above rule offers students the opportunity to develop a somewhat individualized plan of study with intellectual incentives and opportunities in addition to those in a regular curriculum.

In addition, upon the recommendation of the department chairperson, superior students may be allowed to count credits from up to two 800-level courses toward both a bachelor's degree and a master's degree provided that the student has been admitted to the master's program.

Research Opportunity The talents and expertise of the faculty in all departments are reflected in the number of on-going research projects. Undergraduate students are included in many of these research projects. The intent is to discover and to foster the creative talents of students. In funded research projects, there may be an opportunity for students to be paid while learning.

Some flavor of the multiplicity of the research programs is reflected in special facilities, a few of which are: Analog Computer Facility, Antenna Systems Laboratory, Bioelectronics Laboratory, Center for Industrial and Institutional Development (CIID), Computation Science Center, Electronics Laboratory, Engineering Design and Analysis Laboratory, Fluid Mechanics Laboratory, Materials Laboratories, Mechanics Research Laboratory, Sanitary Engineering Laboratory, Solid State Laboratory, Space Science Center, Wind Tunnel and Water Tunnel Facility, and X-Ray Laboratory.

Students have the opportunity to acquire applied experience in business and industry through the Center for Industrial and Institutional Development. CIID undertakes client-sponsored professional projects in management and technical areas for business, industry, and state and local governments.

Preparing for Teaching Students interested in Mathematics Education (elementary or secondary), Chemistry and Physics Teaching, or Earth Science Teaching should refer to the material on Preparing for Teaching that begins on page 21 and the appropriate department description of the requirements.

Chemical Engineering

Stephen S.T. Fan, Chairperson

Chemical engineering is concerned with the analysis and design of processes that deal with the transfer and transformation of energy and material.

The practice of chemical engineering includes the conception, development, design, and application of physicochemical processes and their products; the economic development, design, construction, operation, control, and management of plants for these processes; and activities relating to public service, education, and research.

Traditional employment areas in the chemical process industries include industrial chemicals, petroleum and petro-chemicals, plastics, pharmaceuticals, metals, textiles, and food. Chemical engineers are also working in increasing numbers in the emerging areas of energy engineering, pollution abatement, biochemical and biomedical engineering, and ocean engineering. Chemical engineers are employed by many of the government laboratories and agencies and by private industries and institutions.

The curriculum is designed to provide adequate training for the student to enter the diverse areas of employment or graduate study. The considerable number of electives in the curriculum provides flexibility to individual students to design a program that fulfills individual needs and interests. This also provides opportunity for students to elect minor options in their programs such as the interdisciplinary minors in environmental engineering and ocean engineering.

A minimum of 131 credits is required for graduation with the degree of Bachelor of Science in Chemical Engineering. There are 10 electives in the chemical engineering curriculum in addition to the two technical electives. Six of these are for arts, humanities, and social science requirements. Among the remaining four electives, two should be chosen from chemical engineering courses.

		Fall	Spring
Freshman Year			
English 401	Freshman English	4	
Math 425-426	Calculus I and II	4	4
Phys. 407-408	General Physics I and II	4	4
Chem. 405	General Chemistry	4	
Ch.E. 410	Survey of Current Energy and Pollution Issues		4
Elective			4
		16	16
Sophomore Year			
Chem. 683-684	Physical Chemistry I and II	3	3
Chem. 685-686	Physical Chemistry Laboratory	2	2
Math 527	Differential Equations	4	
Math 403	Introduction to Digital Computer Programming	2	
Ch.E. 501-502	Introduction to Chemical Engineering	2	4
Electives (2)		4	4
Tech. Elective			4
		17	17
Junior Year			
Chem. 545	Organic Chemistry	3	
Chem. 546	Organic Chemistry Laboratory	2	

Ch.E. 601	Fluid Mechanics and Unit Operations	4	
Ch.E. 602	Heat Transfer and Unit Operations		4
Ch.E. 603	Applied Mathematics for Chemical Engineering	4	
Ch.E. 604	Chemical Engineering Thermodynamics		4
Electives (2)		4	4
Tech. Elective			4
		17	16
Senior Year			
Ch.E. 605	Mass Transfer and Stagewise Operations	4	
Ch.E. 606	Chemical Engineering Kinetics	4	
Ch.E. 608	Chemical Engineering Design		4
Electives (5)		8	12
		16	16

Chemistry

A.R. Amell, Chairperson

The student interested in chemistry may major in one of four programs offered in the department depending upon the student's plans for a career. Since the required chemistry courses in each degree program are the same in the first year, it is easy to change from one program to another, or even to another major.

In each of the programs the student should register for the following courses in the first year: Chemistry 405 (1st semester), Introductory Chemistry; Chemistry 406 (2nd semester), Quantitative Analysis; Mathematics 425 (1st semester), Calculus I; Mathematics 426 (2nd semester), Calculus II; and Physics 407 (2nd semester), General Physics I.

Bachelor of Science in Chemistry

This curriculum is intended to prepare the student for the career of a professional chemist and to provide a strong foundation for graduate study in chemistry or in interdisciplinary areas of science calling for a strong background in chemistry. It requires a greater depth in chemistry and physics than do the other degree programs.

Requirements

1. Satisfy General Education requirements.
2. Language requirement: Much of the chemical literature is in German or Russian, and has not been translated. The student must demonstrate a proficiency in one of these languages by completing a year's course in that language. The choice is up to the student.
3. Physics 407 in the second semester of the first year.
4. For specific course requirements, see accompanying chart.

Bachelor of Arts, Chemistry Major

This curriculum offers the student interested in chemistry the opportunity to combine a chemistry major with other interests. There are fewer required courses in chemistry and physics, and the student has more opportunity to elect courses in other areas according to individual interests. The pre-healing arts students interested in chemistry, those preparing for secondary school teaching, or those interested in business can combine these interests with chemistry in this curriculum.

Requirements

1. Satisfy General Education requirements.
2. All requirements for the Bachelor of Arts degree (see page 17).
3. For specific course requirements, see accompanying chart.

Bachelor of Arts, Science Major, Chemistry Concentration

This curriculum is for the student interested in chemistry, but wishing a broader exposure to other disciplines than is obtained in a chemistry major. Students interested in interdisciplinary science or in chemistry as a cultural subject can satisfy their interests in this degree program. It is not intended to prepare professional chemists but rather as the basis for a broad liberal education.

Requirements

1. Satisfy General Education requirements.
2. All requirements for the Bachelor of Arts degree (see page 17).
3. For specific course requirements, see accompanying chart.

Bachelor of Arts, Chemistry and Physics Teaching

This major is designed for students who wish to teach chemistry and physics in secondary schools. The number of positions available for teaching only chemistry or physics is limited, and there are many opportunities to teach both subjects on the secondary-school level. Chemistry and Physics Teaching majors will have good preparation for teaching these subjects and will have the necessary mathematics and education background.

Requirements

1. Satisfy General Education requirements.
2. All requirements for the Bachelor of Arts degree satisfied (see page 17).
3. Chemistry requirements: 405, Introductory Chemistry, or 403-404, General Chemistry; 406, 407, Quantitative Analysis; 545, 546 or 547-548 and 549-550, Organic Chemistry; 683-684 and 685-686, Physical Chemistry I and II.
4. Physics requirements: 407, General Physics I; 408, General Physics II; 505, General Physics III; 506, General Physics IV; 605, Experimental Physics I; and Physics 406, Introduction to Modern Astronomy, strongly recommended.
5. Math requirements: 425, Calculus I, and 426, Calculus II.
6. All education courses in Teacher Preparation Program (see page 17).

Chemistry Department Baccalaureate Degree Requirements

Course		B.S	B.A., Chem. Major	B.A., Science Major
405	Introductory Chem.*	x	x	x
406 & 407, or 517 & 518,	Quantitative Analysis	x	x	x
547 & 549, or 651 & 653	Organic Chemistry	x	x	
548 & 550, or 652 & 654	Organic Chemistry	x	x	
683 & 685	Physical Chem. I	x	x	
684 & 686	Physical Chem. II	x	x	
762 & 763	Instrumental Methods	x	x	4 other chemistry courses chosen from these except 697 and 698
697	Chemical Literature	x		
698	Seminar	x		
699	Senior Thesis	x	2 other chemistry courses chosen from these except 697 and 698	
755 & 756	Advanced Organic Chem.	x		
774 & 775	Inorganic Chem. III	x		
776 & 777	Physical Chem. III	x		
663	Radiochemistry			
708	Introduction to Research			
Other Requirements		Math 425-426, Calculus Physics 407-408-506 General Physics I, II and IV German 401-402 or Russian 401-402 Math 403 or 410 Computer Programming 1 other chem. or chem.-related course	Math 425-426, Calculus Physics 407, General Physics I or Physics 401-402 Introductory Physics	Math 425-426, Calculus 3 approved courses in math or science to complete major requirement. 2 other science or math courses to complete University science requirement.

*Chem. 403-404 may be substituted for Chem. 405.

Civil Engineering

Robert P. Vreeland, Chairperson

The Civil Engineer is concerned with planning, design, and construction of public and private facilities including those for: transportation; control, purification, and distribution of water; collection and treatment of waste products; and residential and industrial purposes. Facilities must not only provide safe, efficient service to the users but must, in addition, be compatible with the environment (both natural and human) in which they are placed. Since many of the clients are governmental agencies, the civil engineer must secure approval of the citizens involved or their elected representatives.

The curriculum rests upon the twin bases of the sciences and the liberal arts. The properties of the substances with which s/he will work (construction materials, soils, and water) are derived from the science base in a series of courses in the middle years of the curriculum.

Each student will select, at the start of the second semester of the junior year one of the options: Environmental Engineering, Constructed Systems, or Student Designed.

The program will permit the graduate to enter professional practice or to pursue further studies either in Civil Engineering or in one of its associated fields (architecture, planning, land development, government service, etc.).

A minimum of 131 credits is required for graduation with the degree of Bachelor of Science in Civil Engineering.

Freshman Year		**Fall**	**Spring**
C.E. 400	C.E. Lectures	0	
C.E. 404	Eng. Comp. Appl.		2
Chem. 403,404	Gen. Chemistry	4	4
Math 425,426	Calculus I,II	4	4
Engl. 401	Freshman English	4	
Phys. 407	Gen. Physics I		4
Math 403	Dig. Comp. Prog.	2	
Electives (2)		4	4
		18	18

Sophomore Year			
C.E. 525,526	Mechanics I,II	3	3
C.E. 527	Mechanics III		3
C.E. 505	Surveying	4	
Phys. 408	Gen. Physics II	4	
Math 527	Diff. Eq.	4	
Math (one of 528,636,645,753)			4
Electives (2)			8
		15	18
Junior Year			
C.E. 622	Eng. Materials	4	
C.E. 642	Fluid Mechanics	4	
C.E. 643	Env. Poll. Ctl.	3	
C.E. 681	Struct. Analysis	4	
C.E. 623	Systems Analysis		3
C.E. 644	Water and Wastewater		3
C.E. 665	Soil Mechanics		4
C.E. 682	Struct. Design		4
Elective (1)			4
		15	18
Senior Year			
Electives		16	13

The electives will be chosen to meet the requirements of the University and of the option selected.

Environmental Engineering Option

P.L. Bishop, Adviser

Environmental Engineering is the application of engineering principles and practices to one or more elements of the environment to protect or improve the quality of life. The environmental engineer uses specialized engineering knowledge in order to systematically manage water, air, and land resources. This option provides fundamental environmental engineering concepts and methods of design and allows specialization in the area of the student's choice.

Required Courses: Micro. 503, General Microbiology; C.E. 743, Environmental Sampling and Analysis; C.E. 746, Wastewater Treatment Plant Design, or C.E. 747, Water Treatment Plant Design.

Elective Courses (any 2): C.E. 745, Hydrology and Hydraulics; C.E. 748, Solid Waste Disposal; Chem. 547, Organic Chemistry; Chem. 683, Physical Chemistry; Ch.E. 609, Fundamentals of Air Pollution and Its Control; Micro. 501, Public Health and Sanitation.

Constructed Systems Option

L.H. Klotz, Adviser

All structures, regardless of the purpose they may serve, must be planned, designed, and built to resist the forces generated by nature (gravity, wind, earthquake) and those imposed by man during the construction and use of the structure.

Required Courses: C.E. 685, Indeterminate Analysis; C.E. 793 or C.E. 794, Advanced Structural Design I or II.

Elective Courses 8 credits from: C.E. 731, Network Planning and Scheduling; C.E. 745, Hydrology and Hydraulics; C.E. 763, Advanced Soil Mechanics I; C.E. 765, Foundation Engineering; C.E. 782, Timber Design; C.E. 793 or C.E. 794, Advanced Structural Design I or II. Four credits from: Art 455, Drafting and Architectural Design; Earth Sciences 401, 402, Principles of Geology; Math (any course 600 or above); M.E. 441, Engineering Graphics; M.E. 727, Advanced Mechanics of Solids; S.&W.S. 703, Soil and Water Engineering; S.&W.S. 705, Principles of Hydrology; S.&W.S. 710, Ground Water Hydrology.

Student Designed Option

J.H. Zoller, Adviser

The Student Designed Option is offered for students who wish to enter the general practice of Civil Engineering. Design courses correlate basic theories and building code and specification requirements and apply all available techniques to the solution of practical engineering problems which resemble as closely as possible the real life situations which will be encountered on the job after graduation.

The Civil Engineering Department currently offers design courses in the fields of structures, soil mechanics, water and wastewater treatment, and facility design. Courses totaling at least 20 credits (of which one and only one course of 3 or 4 credits must be outside the department) will be selected in consultation with the adviser.

Earth Sciences

Herbert Tischler, Chairperson

The courses offered in the Department of Earth Sciences cover the broad spectrum of geology and oceanography. They encompass a group of related studies concerned with an understanding of the size, shape, and constitution of the earth; the processes that are now, or have formerly been, at work upon its surface, in its oceans, and within its interior; its origin, and evolution of life upon it.

The need for people trained in the earth sciences has been emphasized by the search for new and additional energy sources, essential mineral resources, by man's increased concern with intelligent management of his environment, and by expansion of research in both oceanography and extra-terrestrial geology. In addition, the demand for well-trained secondary school teachers of earth science has steadily increased over the past few years.

Four undergraduate degree programs are offered through the Department of Earth Sciences.

Bachelor of Science in Geology

This program represents the strongest concentration in the earth and cognate sciences and is especially well suited for students who plan to continue their studies in graduate school. Beyond a central core of courses there is sufficient flexibility in course selection so that a student may, in consultation with his/her academic adviser, orient the program toward a particular facet of the earth sciences (e.g. mineralogy-petrology, oceanography, geomorphology, paleontology-stratigraphy, etc.).

Requirements

1. Satisfy the General Education requirements.
2. Satisfactorily complete Math 425-426, Chem. 403-404, and Phys. 407-408.
3. Complete a minimum of 12 courses in Earth Science, which should include: E.S. 401-402, Principles of Geology; E.S. 501, Introduction to Oceanography; E.S. 512, Descriptive and Determinative Mineralogy; E.S. 613, Principles of Mineralogy, and/or E.S. 614, Petrography; E.S. 531, Structural Geology; E.S. 561, Geomorphology; E.S. 652, Invertebrate Paleontology; E.S. 754,

Sedimentation-Stratigraphy; and three approved Earth Sciences electives.

4. Complete Mathematics 527-528 or approved electives.
5. Complete two additional approved electives.

Bachelor of Arts, Geology Major

This program offers students an opportunity to obtain a broad liberal education in a general background in geology with a greater degree of freedom in choosing electives than in the Bachelor of Science program. By a careful choice of electives a student can prepare for graduate school, business, or industry.

Requirements

1. Satisfy the General Education requirements.
2. Satisfy the requirements for the Bachelor of Arts degree (page 17).
3. Complete a minimum of eight courses in the department (with a C- or better) which should include: E.S. 401-402, Principles of Geology; E.S. 512, Descriptive and Determinative Mineralogy; and five upper-level Earth Science courses, two of which must be chosen from courses numbered 700 or above.
4. Math requirements: 425, Calculus I, and 426, Calculus II.

It is strongly advised that students complete, as early as possible, a year each of college chemistry and physics.

It is also suggested that students include History 521-522, History of Science, in their program.

Bachelor of Arts, Science Major, Earth Sciences Concentration

This program is for the student who wants a liberal education with a scientific slant to it. It is not designed to produce professional scientists but rather combines the liberal arts with a reasonable exposure to science in general and to earth sciences in particular.

Requirements

1. Satisfy the General Education requirements.
2. Satisfy the requirements for the Bachelor of Arts degree (page 17).
3. Complete: E.S. 401-402, Principles of Geology; E.S. 501, Introduction to Oceanography; and three approved Earth Science electives.
4. Math requirements: 425, Calculus I, and 426, Calculus II.
5. Additional major requirements: three approved courses in science over and above those used to satisfy University general education requirements.

Bachelor of Arts, Earth Science—Teaching Major

This program is specifically designed to prepare the student to teach earth science in secondary school. Upon graduation from this program students receive full teacher certification which is recognized in most states.

Requirements

1. Satisfy the General Education requirements.
2. Satisfy the requirements for the Bachelor of Arts degree (page 17).
3. Complete: E.S. 401-402, Principles of Geology; E.S. 501, Introduction to Oceanography; Geog. 473, The Weather; Chem. 401-402, General Chemistry; Phys. 401-402, Introduction to Physics; Phys. 406, Introduction to Modern Astronomy; plus 12 approved elective credits from intermediate and/or advanced Earth Science courses.
4. Math requirements: 425, Calculus I, and 426, Calculus II.
5. Satisfy the secondary-school Teacher-education Program. (See "Preparing for Teaching," page 21.)

Electrical Engineering

Joseph B. Murdoch, Chairperson

During the 1970's, electrical engineers will design systems for investigating the ocean, for monitoring medical procedures, and for processing information from outer space. They will develop electronic instrumentation for environmental protection, design mini- and micro-computers for industry, and use their knowledge to help solve major problems of society such as transportation, pollution, and health care delivery.

At UNH, the keynote of the Electrical Engineering program is the involvement of the student in the solution of real-world problems. During the freshman and sophomore years, the student takes basic courses in mathematics and physics, learns how to use the com-

puter, and receives introductory experience in electric circuits, logic design, and electronics.

In the junior year, the student concentrates in electrical engineering courses in preparation for a nearly completely elective senior year. The student can choose several application-oriented courses in Electrical Engineering, build a technical minor, or complete an option. The year features many opportunities for individual or group projects.

The Electrical Engineering curriculum prepares the student for graduate work in electrical engineering, immediate employment as an electrical engineer, and for graduate work in related areas such as business administration. It is well-suited to the dual degree program described on page 18.

Beginning with students entering in the fall of 1975, Electrical Engineering students must obtain a 2.0 grade-point average in major E.E. courses as a requirement for graduation.

Basic Curriculum for Bachelor of Science in Electrical Engineering

The student, with the adviser's assistance, should plan a program based on the following distribution of courses:

1. For students who will be juniors and seniors in the fall of 1976—129 credits required for graduation.

		Fall	Spring
Junior Year			
E.E. 551-552	Electronics II and III	3	3
E.E. 603-604	Electromagnetic Fields and Waves I and II	3	3
E.E. 607	Electrical Circuits III	3	
E.E. 654	Energy Conversion	3	3
One M.E. course in either semester†		(3)	(3)
E.E. 518	Electrical Laboratory		3
Electives (2)		4-8	4-0
		16-17	15-16
Senior Year			
E.E. 609	Electronic Materials and Devices	3	
Electives	The student may arrange his senior electives in any manner, provided that he satisfies all General Education requirements (page 16) and elects at least three electrical engineering 700-level courses or approved substitutes.		

*Chosen from M.E. 526, 527, Mechanics II, III; M.E. 506, Introduction to Fluid Mechanics and Convective Heat Transfer.

Minors and Options

Students in Electrical Engineering, while fulfilling the basic curriculum requirements for a major in E.E. may in addition complete one of two interdisciplinary minors or one of four Electrical Engineering elective options. The minors are in Ocean Engineering and Bioelectronics Engineering and are described at the beginning of this chapter.

Three of the elective options are in specific technical areas of Electrical Engineering and the fourth is Student Designed. Each option requires four courses, two specified and two elective, in addition to the core Electrical Engineering curriculum. Either an option or a minor can be completed without exceeding 129 credits. Descriptions of the options follow

Communications Systems Option

R.R. Clark, Adviser

This specialization provides the student with the fundamentals of communication theory and signal processing as they relate to communications systems. Included are Fourier analysis, amplitude and frequency modulation, detection, system noise considerations, and digital and sampled data signals. An introduction into such areas as information theory, coding, and optimal communications systems is included and designs of communication systems, RF amplifiers, modulators, detectors, receivers, antenna systems, and multiplexers are covered as applications of communication theory.

Required Courses: E.E. 757, Fundamentals of Communications; E.E. 758, Communication Systems.

Elective Courses (any 2): E.E. 695, Electrical Engineering Projects; E.E. 701, Applied Electromagnetic Fields; E.E. 714, Minicomputer Applications Engineering; E.E. 741, Fundamentals of Acoustics; E.E. 782, Control Systems; E.E. 785, Underwater Acoustics; Math 646, Analysis for Applications; Math 647, Complex Analysis for Applications; Math 710, Advanced Programming Systems (cannot be elected if E.E. 714 is elected); Math 735, Probability.

Computer Engineering Option

J.L. Pokoski, Adviser

During the past several years, advances in the technology of electronic circuit manufacture have vastly reduced the costs of digital computers. This low cost, coupled with flexibility, has allowed them to be used in a broad variety of applications from data processing in a small retail store to controlling a machine tool in a manufacturing plant. Since computers are basically electronic devices, it is primarily the job of the electrical engineer to design or specify the purchase of the computer and integrate it into larger systems. This requires a knowledge of both hardware (circuits) and software (programming) concepts. In this option, the student will learn to design, build, and test systems involving digital computers.

Required Courses: E.E. 712, Logical Design of Digital Computers; E.E. 714, Minicomputer Applications Engineering.

Elective Courses (any 2): E.E. 695, Electrical Engineering Projects; E.E. 711, Digital Systems; Math 710, Advanced Programming Systems; Math 711, Programming Languages and Compiler Construction; Math 753, Numerical Methods and Computers; Math 754, Numerical Methods and Computers.

Instrumentation and Control Option

A.L. Winn, Adviser

Electrical Engineers are frequently required to develop electromechanical, thermoelectric, or electrochemical measuring devices for monitoring and collecting physical data and amplifying and modifying the electrical signals representing such data to a form suitable for recording and analysis. Such systems are called instrumentation systems, the design of which involves a background in computer hardware and software and electronic devices and circuits. When the output from such an instrumentation system is used in a feedback loop to control a process or plant, electrical engineers are often required to use mathematical techniques to determine and regulate the dynamic response of the system. This necessitates a knowledge of control system theory. The student in this option will analyze, design, construct, and test typical instrument and control systems, including the computer manipulation of data.

Required Courses: E.E. 781, Ocean Instrumentation Project, E.E. 782, Control Systems.

Elective Courses (any 2): E.E. 695, Electrical Engineering Projects; E.E. 727, Power Systems; E.E. 714, Minicomputer Applications Engineering; M.E. 741, Control of Physical Systems; Math 645, 646, Analysis for Applications; Math 735, Probability; Tech 601, Statistical Methods in Engineering and Physical Science; Res. Ec. 715, Linear Programming Methods.

Student Designed Option

D.W. Melvin, Adviser

This program is for the student whose goals do not coincide with the other Electrical Engineering options. Such students will be expected to arrange with their advisers a set of four elective courses that best meet their goals and interests. At least three of these elective courses will be E.E. 700-level courses. This program provides the opportunity to gain a broad background in E.E. or to prepare for work in areas other than those specified by the other options. Such areas include solid state electronics, business management, applied mathematics, illumination, acoustics, and electrical utility engineering.

II. For students who will be freshmen and sophomores in the Fall of 1976—134 credits required for graduation.

This new curriculum consists of a core plus three options—Computer Engineering, Electrical Engineering Systems, and Electrical Engineering Science. The core material totals 106 credits; each option requires 28 credits. An E.E. student must complete the core plus one of the options or one of the engineering minor programs. A student choosing the latter must take three E.E. 700-level electives or approved equivalents. Students should select an option or a minor at the end of the sophomore year.

The Computer Engineering option permits the student to obtain experience in both the hardware and software aspects of computers and signal processing. The Electrical Engineering Systems option provides the student with background in both communication and control systems. The Electrical Engineering Science option is for those students who are more mathematically and theoretically oriented and wish to build upon the scientific content of the core curriculum.

First Two Years Common to All Options

		Fall	Spring
Freshman Year			
Core Courses			
Math 425-426	Calculus I & II	4	4
Engl. 401	Freshman English		4
Elective	Life Science Elective	4	
Math 410	Digital Computer Systems		4
E.E. 401-402	Introduction to Electrical Engineering I & II	1	1
Phys. 407	General Physics I		4
Electives (2)	Group II	8	
		17	17
Sophomore Year			
Core Courses			
Math 527	Differential Equations	4	
E.E. 544	Signal Processing Fundamentals		3
Phys.408,505	General Physics II & III	4	4
E.E. 541-542	Electrical Circuits I & II	4	4
E.E. 543	Introduction to Digital Systems	3	
E.E. 548	Electronics I		3
Elective (1)	Group II		4
		15	18
Junior Year			
Core Courses			
E.E. 551-552	Electronics II & III	3	3
E.E. 603	Electromagnetic Fields and Waves I	3	
E.E. 517-518	Junior Laboratory I & II	1	3
M.E. 525	Mechanics I	3	
M.E. 505	Intro. to Thermodynamics & Heat Transfer		3
Electives (2)	Group II	4	4
	Subtotal	14	13
Cmp. Eng. Option*			
E.E. 714	Minicomputer Applications Engineering	4	
E.E. 712	Logical Design of Digital Computers		4
	Total	18	17
EE Sys. Option*			
E.E. 714	Minicomputer Applications Engineering	4	
E.E. 656	Electromechanical Devices		4
	Total	18	17
*EE Sci.**			
Elective	Math Elective	4	
E.E. 604	Electromagnetic Fields & Waves II		4
	Total	18	17
Senior Year			
Core Courses			
Elective (1)	Group II	4	
Electives (2)	Non-E.E. Electives	4	4
	Subtotal	8	4
Cmp. Eng. Option*			
Math 611	Assembler Lang. Prog.	4	
Math 710	Advanced Prog. Systems		4
E.E. 695 or 711, or Math 612, 711 or 753			4
E.E. 757 or 782		4	
Elective	Approved Pro. Elec.		4
	Total	16	16
EE Sys. Option*			
E.E. 757	Fund. of Communications	4	
E.E. 782	Control Systems		4
Electives	Approved Pro. Elec.	4	8
	Total	16	16
EE Sci. Option*			
E.E. 757 or 782		4	
E.E. 762 or 741			4
E.E. 605	Electronic Properties of Materials and Devices		4
Electives	Approved Prof.	4	4
	Total	16	16

*Symbols: Cmp. Eng. = Computer Engineering Option; E.E. Sys = E.E. Systems Option; EE Sci. = E.E. Science Option.

Note: Students who have not had a year of high school chemistry with a grade of B or better are required to take Chemistry 403 sometime during their college program. For those students, 138 credits are required for graduation.

Engineering Technology

Donald Melvin, Director

Engineering technology is the part of the engineering field which requires the application of engineering and scientific knowledge and methods combined with technical skills in support of engineering activities. Normally engineering technology is not concerned with the development of new principles and methods. The Engineering Technology Program offers only junior- and senior-level work. Students admitted to this program must have an appropriate associate degree from the New Hampshire Technical Institute, the Vermont Technical College, or an equivalent school.

Curricula in electrical engineering technology and mechanical engineering technology are offered. The student may continue study in his or her field of specialization, to select electives which broaden his or her educational background, and participate in project courses where as part of a technology team talents are applied in solving real problems.

Electrical Engineering Technology

		Fall	Spring
Junior Year			
E.T. 671	Industrial Electronics	4	
E.T. 677	Integrated Electronics	4	
E.T. 637-638	Heat and Fluid Power I and II	4	4
E.T. 674	Control Systems & Components		4
E.T. 680	Comm. and Fields		4
Electives (2)		4	4
		16	16
Senior Year			
E.T. 691-693-694	EET Project I, II, and III	8	4
E.T. 633	Indus. Org & Law	4	
E.T. 634	Economics of Business Activities		4
Electives (3)		4	8
		16	16

Mechanical Engineering Technology

		Fall	Spring
Junior Year			
E.T. 637-638	Heat and Fluid Power I and II	4	4
E.T. 641	Production System	4	
E.T. 675-676	Electrical Technology I and II	4	4
E.T. 644	Dynamics of Machinery		4
Electives (2)		4	4
		16	16
Senior Year			
E.T. 651-653-654	MET Project I, II, and III	8	4
E.T. 633	Indus. Org. & Law	4	
E.T. 634	Economics of Business Activities		4
Electives (3)		4	8
		16	16

Mathematics

M.E. Munroe, Chairperson

There are five undergraduate programs offered through the Department of Mathematics. Normally student will enter one of these specific programs. However, if the following Mathematics courses are taken during the first two years, a student is fully prepared to satisfy the Mathematics requirements in any one of these programs and so may change degree programs at the end of the sophomore year: Math 425, Calculus 1; Math 426, Calculus II; Math 510, Mathematical Computer Problems; Math 527, Differential Equations with Linear Algebra; Math 528, Multidimensional Calculus; and Math 531, Introduction to Abstract Mathematics.

In some programs there are courses outside Mathematics that should be completed in the sophomore year. These are noted in the detailed lists of requirements that follow.

Bachelor of Science in Mathematics

This program represents the strongest concentration in Mathematics of any of the programs offered by the department. Included among the required courses are those usually required for admission to graduate work in Mathematics. Through a judicious choice of electives the student may construct a stronger pregraduate program or s/he may slant the program toward a career in business or industry.

Requirements

1. General Education requirements must be satisfied and Physics 407-408 must be included among the science courses.

2. Language requirement: The student must demonstrate proficiency in one of the three languages: French, German, or Russian. (See B.A. requirements page 17.)

3. Mathematics requirements: Math 425, Calculus I; Math 426, Calculus II; Math 510, Mathematical Computer Problems; Math 527, Differential Equations with Linear Algebra; Math 528, Multidimensional Calculus; Math 531, Introduction to Abstract Mathematics; Math 761, Abstract Algebra; Math 762, Linear Algebra; Math 767, One-dimensional Analysis; Math 784, Topology; Math 788, Complex Analysis; and three approved Mathematics electives.

Bachelor of Arts, Mathematics Major

This program offers a broader liberal education than do any of the Bachelor of Science programs. However, by a careful choice of electives the student can shape this major into a preparation for graduate school, business, or industry.

Requirements

1. Satisfy General Education requirements.

2. Satisfy requirements for the Bachelor of Arts degree (page 17).

3. Mathematics requirements: Math 425, Calculus I; Math 426, Calculus II; Math 527, Differential Equations with Linear Algebra; Math 528, Multidimensional Calculus: Math 531, Introduction to Abstract Mathematics; Math 761, Abstract Algebra; Math 762, Linear Algebra; Math 767, One-dimensional Analysis; and three approved Mathematics electives.

Bachelor of Arts, Science Major, Mathematics Concentration

This program is for the student who wants a liberal education with a scientific slant to it. It is not designed to produce professional scientists but rather combines the Liberal Arts with a reasonable exposure to science in general and Mathematics in particular.

Requirements

1. Satisfy General Education requirements.

2. Satisfy requirements for the Bachelor of Arts Degree (page 17).

3. Mathematics requirements: Math 425, Calculus I; Math 426, Calculus II; Math 510, Mathematical Computer Problems; Math 527, Differential Equations with Linear Algebra; Math 528, Multidimensional Calculus; Math 531, Introduction to Abstract Mathematics; Math 761, Abstract Algebra, or Math 767, One-dimensional Analysis; and one approved Mathematics elective.

4. Additional major requirements: three approved courses in science over and above those used to satisfy General Education requirements.

Bachelor of Science in Mathematics-Education

This is a professional degree program to prepare the student for teaching mathematics at the elementary or secondary level. The program is coordinated with the education department's five-year, teacher-certification program. A student may complete the degree requirements in four years; however, to receive full teacher certification a year-long teaching internship in the fifth year is required. (The internship can be coupled with other graduate work leading to a master's degree.) See "Preparing for Teaching," page 21.

Requirements

1. Satisfy General Education requirements.

2. Education requirements: Ed. 500, Exploring Teaching; Ed. 700, Educational Structure and Change; Ed. 701, Human Learning and Development; Ed. 703, Alternative Teaching Models; Ed. 705, Perspectives on the Nature of Education.

Elementary Option

3. Mathematics requirements: Math 419, Evolution of Mathematics; Math 425, Calculus I; Math 426, Calculus II; Math 410, Digital Computer Systems; Math 636, Probability and Statistics; Math 657, Geometry; Math 621, 622, 623, Number Systems, Geometry, and Topics in Mathematics for Elementary School Teachers; Math 703, Mathematics Education, K-6; Math 791, Mathematics-Education; one approved mathematics elective.

4. Additional major requirements: Physics 406, Introduction to Modern Astronomy; Ed. 706, Introduction to Reading.

Secondary Option

3. Mathematics requirements: Math 425, Calculus I; Math 426, Calculus II; Math 510, Mathematical Computer Problems; Math 527, Differential Equations with Linear Algebra; Math 528, Multidimensional Calculus; Math 531, Introduction to Abstract Mathematics; Math 636, Probability and Statistics; Math 657, Geometry I; Math 698, Senior Seminar; Math 761, Abstract Algebra; Math 791, Mathematics-Education; and two approved mathematics electives.

Bachelor of Science (Interdisciplinary Programs in Mathematics and Its Applications)

These programs are designed to prepare the student for employment in various areas of Applied Mathematics. Certain of them also lead to graduate work in appropriate fields (e.g. chemical physics, computer science, economics). In this program the major may consist of Mathematics combined with any one of the following disciplines: Chemistry, Computer Science, Economics, Electrical Science, Control Theory, Fluid Dynamics, Mechanics, Thermodynamics, and Physics.

Requirements

1. Satisfy General Education requirements.

2. Core mathematics requirements: Math 425, Calculus I; Math 426, Calculus II; Math 510, Mathematical Computer Problems, or Math 410, Digital Computer Systems; Math 527, Differential Equations with Linear Algebra; Math 528, Multidimensional Calculus; and Math 645, Applied Linear Algebra.

3. Additional Mathematics requirements:

In Mathematics-Computer Science: four approved Mathematics electives. Proper choice of these depends mainly on the student's career objectives. These electives should be chosen only in consultation with a faculty adviser designated by the Math Department.

In Mathematics-Economics: Math 735, Probability; Math 736, Statistics; and two approved Mathematics electives.

In all other options: Math 646, Analysis for Applications II; Math 647, Complex Analysis for Applications; and two approved Mathematics electives.

4. Requirements in other disciplines: Each interdisciplinary major consists of 10 Mathematics courses (see above) plus five courses in the other discipline. Specific requirements follow. If more than five courses outside Mathematics are required or elected, the excess over five may be used to satisfy appropriate General Education requirements.

Mathematics—Chemistry Option

Chem. 405, Introductory Chemistry; Chem. 683, Physical Chemistry I, *and* Chem. 685, Physical Chemistry Laboratory (these two courses regarded as a single unit); Chem. 684, Physical Chemistry II, *and* Chem. 686, Physical Chemistry Laboratory (these two courses regarded as a single unit); Chem. 776, Physical Chemistry III; *either* Physics 701, Introduction to Quantum Mechanics, or Chem. 775, Inorganic Chemistry.

Note: Chem. 547-548, Organic Chemistry, suggested as elective for those planning to do graduate work in chemical physics. Chemistry 405 should be taken no later than the sophomore year.

Mathematics—Computer Science Option

A total of five of the following courses, including at least one from each of the following three groups: Group 1: Math 611, Assembler Language Programming; Math 612, Data Structures and Processes; Math 710, Advanced Programming Systems; Math 711, Programming Languages and Compiler Construction. Group 2: Math 753-754, Numerical Methods and Computers. Group 3: E.E. 531, Elements of Digital Systems; E.E. 711, Digital Systems; E.E. 712, Logical Design of Digital Computers; E.E. 714, Minicomputer Applications Engineering.

Mathematics—Economics Option

Economics 401-402, Principles of Economics (Macro, Micro); Economics 605, Intermediate Economic Analysis; Economics 611, National Income Analysis; and any two of the following three courses: Economics 727, Introduction to Econometrics; Economics 728, Statistical Decision-Making; Administration 705, Operations Research.

Note: Economics 401-402 should be taken no later than the sophomore year.

Mathematics—Electrical-Science Option

E.E. 541-542, Electrical Circuits I and II; E.E. 603-604, Electromagnetic Fields and Waves I and II; and any two of the following three courses: E.E. 701, Applied Electromagnetic Fields; E.E. 757, Fundamentals of Communications; E.E. 782, Control Systems.

Mathematics—Control-Theory Option

E.E. 541-542, Electrical Circuits I and II; *either* M.E. 503, Thermodynamics I, *or* M.E. 523, Solid Mechanics I; M.E. 741, Control of Physical Systems; E.E. 782, Control Systems.

Mathematics—Fluid-Dynamics Option

M.E. 503, Thermodynamics I; M.E. 508, Fluid Dynamics; M.E. 525, Mechanics I; M.E. 707, Analytical Fluid Dynamics; M.E. 708, Gas Dynamics.

Mathematics—Mechanics Option

M.E. 503, Thermodynamics I; M.E. 525, 526, 527, Mechanics I, II, and III; any two of the following three courses: M.E. 723, Advanced Dynamics; M.E. 724, Introduction to Vibrations; and M.E. 727, Advanced Mechanics of Solids.

Mathematics—Thermodynamics Option

M.E. 503, Thermodynamics I; M.E. 508, Fluid Dynamics; M.E. 525, Mechanics I; and any two of the following three courses: M.E. 701, Macroscopic Thermodynamics; M.E. 702, Statistical Thermodynamics; M.E. 703, Heat Transfer.

Mathematics—Physics Option

Physics 407-408, General Physics I and II; Physics 505-506, General Physics III and IV; and *either* Physics 701, Introduction to Quantum Mechanics, and Physics 702, Atomic and Nuclear Physics; *or* Physics 703-704, Electricity and Magnetism I and II.

Note: Physics 407-408 should be taken no later than the sophomore year.

Mechanical Engineering

William Mosberg, Chairperson

Mechanical engineering is a challenging profession encompassing a broad spectrum of activity. It contributes to the research; design; development; and production of aerospace vehicles, underwater vessels, instrumentation and control systems, nuclear and conventional power plants, and consumer and industrial products in general. The profession also makes contributions through more fundamental studies of material behavior, the mechanics of solids and fluids, and energy transformation.

The curriculum in mechanical engineering is designed to prepare the prospective graduate either for more advanced studies or for beginning a professional engineering career. To accomplish these objectives, the program of study provides a foundation in the basic physical sciences, mechanics of solids and fluids, dynamic systems, thermal sciences, materials science, and design. Flexibility in the curriculum enables the student to gain competence in any of these specific areas, developing abilities in analysis, experimentation, and engineering design. The curricula include elective courses in the arts, the humanities, and the social sciences to provide a liberal education.

The program in mechanical engineering is further designed to develop the student's creative potential to meet the increasingly complex needs of industry, government and education, while appreciating the role of technology in a modern society.

The student, with the adviser's assistance should plan a program based on the following distribution of courses which average 16 credit hours per semester totaling not less than 128 credits.

The outline which follows is to be considered as being typical only in terms of format. Within the constraints of satisfying all of the requirements and having all necessary prerequisites, an individual student's schedule may vary from the following. Such variation will in general be caused by scheduling needs or student preference.

All elective courses will be chosen, in consultation with a departmental adviser, from courses which will lead to a balanced program in the student's chosen area of interest. The free electives are entirely the student's own choice and are without constraint. Technical elective requirements are 12 credits.

		Fall	Spring
Freshmen Year			
Eng. 401*	Freshman English (or "free" elective if exempted)		4
Chem. 405	General Chemistry	4	
Math 425-426	Calculus I and II	4	4
Phys. 407-408	General Physics I and II	4	4
M.E. 401	Introduction to Mechanical Engineering	4	
M.E. 441	Engineering Graphics		4
		16	16
Sophomore Year			
Math 528	Mutidimensional Calculus	4	(4)
Math 527	Differential Equations with Linear Algebra	(4)	4
M.E. 525-526	Mechanics I and II	3	3
E.E. 541-542	Electrical Circuits I and II	3	3
M.E. 561	Introduction to Materials Science	4	
M.E. 503	Thermodynamics I		4
Electives (2)	Arts and Humanities or Social Science	4	
		18	18
Junior Year			
M.E. 527	Mechanics III	3	
M.E. 628	Introduction to Vibrations		3
M.E. 508	Fluid Dynamics	4	
M.E. 703	Heat Transfer		3
Elective (1)	Electrical Science	3	
M.E. 648	Intro. to Meas. and Exp. Methods		3
Electives (2)	Arts and Humanities or Social Science	4	4
Elective (1)	Technical		3(4)
Elective (1)	"free" elective	3(4)	
		17(18)	16(17)
Senior Year			
M.E.	Course to be specified	3	3
Electives (2)	Technical Elective	3(4)	3(4)
Electives (2)	Arts and Humanities or Social Science	4	4
Elective (1)	"free" elective	3(4)	
Elective (1)	Technical Elective		3(4)
M.E. 697	Mechanical Engineering Seminar	1	
		14	13

Physics

John E. Mulhern, Jr., Chairperson

Physics is concerned with the properties of matter and the laws which describe its behavior. It is an exact science based on precise measurement, and its objective is the kind of understanding that leads to the formulation of mathematical relationships between measured quantities. As a fundamental science its discoveries and laws are basic to understanding in nearly all areas of science and technology. Advances in such diverse fields as diagnostic medical techniques, transistors, and air pollution have relied heavily on the application of basic physical laws and principles.

Students interested in the study of physics at the University of New Hampshire will find a strong interaction between research and academic programs. Undergraduates have participated in research studies ranging from atomic spectroscopy using laser sources to astrophysical studies of the solar system using space probes. These experiences have proven very beneficial to engineering as well as physics students alike. The student-faculty ratio in Physics is quite low so that considerable faculty contact with students is encouraged. Strong efforts are being made to utilize the remote access computer terminals in undergraduate courses at all levels. The department also has its own library which provides a comfortable, inviting atmosphere for study and relaxed reading.

The suggested programs below are indicative of the flexibility available to students whether they are preparing for graduate work in physics, industrial opportunities, governmental research, secondary-level teaching, or a general education which might utilize the fundamental knowledge of physics.

The following undergraduate degree programs are offered through the Department of Physics.

Bachelor of Arts, Science Major, Physics Concentration

This is the most flexible degree offered by the department. It is not designed to produce a professional physicist, but rather to provide an opportunity for interdisciplinary combinations with emphasis on physics.

Requirements

1. Satisfy General Education requirements.
2. Satisfy requirements for the Bachelor of Arts degree (page 17).
3. Physics requirements: six courses approved by the department.
4. Math requirements: 425, Calculus I, and 426, Calculus II.
5. Any three approved courses in science not used to satisfy other University requirements.

Bachelor of Arts, Physics Major

This degree provides an opportunity for a broad and liberal education which in some cases may be sufficient for graduate work. A judicious choice of electives may also prepare the student in a restricted area in physics in conjunction with other disciplines or other less technical applications in the field of physics.

Requirements

1. Satisfy General Education requirements.
2. Satisfy requirements for the Bachelor of Arts degree (page 17).
3. Physics 401-402 or 407-408; 505; 506. Note that Mathematics 425-426 are prerequisites for some of the courses.
4. Four additional courses in Physics approved by the department, two of which must be at the 500 level or above.
5. Math requirements: 425, Calculus I, and 426, Calculus II.

Bachelor of Arts, Chemistry and Physics Teaching

For information see page 53.

Bachelor of Science in Physics

This degree is the professional program offered by the department. The required courses are those necessary for admission to graduate work or a career in industry. Additional courses may be beneficial for graduate preparation or may be desirable for more depth in certain areas of physics.

Requirements

1. Satisfy General Education requirements.
2. Satisfy requirements for the Bachelor of Science degree (page 48).
3. One course in English is required in addition to the University requirement.
4. Language Requirement: The student is strongly advised to demonstrate proficiency in French, German, or Russian.
5. Minimum Physics Requirements: 407, General Physics I; 408, General Physics II; 505, General Physics III; 506, General Physics IV; 605, Experimental Physics I; 606, Experimental Physics II; 609, Experimental Physics III (normally taken senior year); 616, Physical Mechanics I (normally taken second semester sophomore year); 617, Physical Mechanics II; 701, Quantum Mechanics; and 703-704, Electricity and Magnetism I and II (should be taken in the junior year).
6. Additional Physics courses may be selected from the following: 510, Cosmology; 602, Thermal Physics; 607, Physical Optics; 610, Experimental Physics IV; 613-614, Special Topics; 695-696, Independent Study; and 702, Atomic and Nuclear Physics.
7. Chemistry: 403 and 404 or Chemistry 405.
8. Math: 425-426, 527-528, plus two approved electives.

School of Health Studies

Basil J.F. Mott, Dean
Edward R. Pierce, Assistant Dean

Departments and Programs
Communication Disorders
Health Studies
Medical Technology
Nursing
Occupational Therapy
Physical Education
Recreation and Parks

Programs of Study
Bachelor of Science
Communication Disorders
Health Studies
Medical Technology
Nursing
Occupational Therapy
Physical Education
Recreation and Parks

General Information

The School of Health Studies, established in 1968, is one of the newest academic components of the University. It was created in response to the growing need for programs of higher education that prepare young men and women for health and health-related careers. A major purpose of the School is development of the University's resources relating to the field of health. Currently the School offers undergraduate instruction leading to the Bachelor of Science degree in Communication Disorders, Health Studies, Medical Technology, Nursing, Occupational Therapy, Physical Education, and Recreation and Parks. Each program has been designed to enable students to obtain a broad cultural background in the humanities and social sciences as well as basic knowledge and skills essential to the practice of their chosen professions.

Degree Requirements

Each cancidate for a degree must satisfy all General Education requirements for graduation as listed on page 16; earn at least 128 credits, including the courses required in one of the curricula described below; and achieve a minimum grade-point average in the curriculum as prescribed. Generally, courses are to be completed in the sequence in which they are arranged.

Minor Option: See page 18 for requirements.
Dual Degree Program: See page 18 for requirements.
Student Designed Major: See page 81 for requirements.
Second Major Option: See page 18 for requirements.

Student Liability Insurance

All students whose programs requires participation in clinical learning experiences must purchase and maintain liability insurance during the entire clinical experience. Proof of such insurance coverage must be furnished to the department before the clinical experience is scheduled to begin. The university has arranged for appropriate insurance coverage at a modest cost to the student. Further information may be obtained at the student's major department office.

Communication Disorders

Communication Disorders is the profession devoted to helping people overcome disabilities of speech, language, or hearing. The undergraduate program in Communication Disorders is a pre-professional program. Specialization in Communication Disorders begins in the freshman year. Students learn about speech, language, and hearing disorders in the usual classroom setting and then become involved in clinical practice. This opportunity is provided in an on-campus clinic and in schools and community rehabilitation clinics off-campus.

A student's professional education should be continued at a college or university offering a graduate program leading to a master's degree and to subsequent certification by the American Speech and Hearing Association. Certified clinicians find employment opportunities in hospitals, schools, community speech and hearing clinics, or private practice.

Students in the Communication Disorders Program must: 1) complete a course in statistics,2) obtain at least a 2.67 grade point average in their first three Communication Disorders courses, and 3) maintain a minimum 2.75 overall grade-point average. The required curriculum for majors in Communication Disorders consists of: 520, Survey of Communication Disorders; 521, Anatomy and Physiology of the Speech and Hearing Mechanism; 524, Applied Phonetics of American English; 631, Speech Pathology I; 632, Speech Pathology II; 634, Clinical Practice in Speech Pathology; 638, The Acquisition of Language; 704, Basic Audiology.

Students interested in this program should consult with the chairperson, Dr. F. Harry Tokay.

Health Studies

The new undergraduate major in health studies accepted its first students in 1975. Students will be prepared to embark upon administrative, planning, and related careers in various beginning and intermediate level positions in the health field. Graduates will work in a variety of settings, for example hospitals, long-term-care facilities, official health agencies, community mental health centers, family planning agencies, insurance agencies, home health

agencies, neighborhood health centers, environmental health agencies, and regulatory agencies.

The academic program is being developed, and new courses will be added over the next two years. Students will take courses in many academic units of the University and gain analytical skills in such areas as economics, politics, and management of health organizations.

Students will enroll in: introductory courses H.S. 401 Introduction to Health Care Systems, and H.S. 402 Public Health and Human Ecology; integrative courses (to be developed): and a field practicum. Opportunities will also be available for development of specialized knowledge in select areas.

Those interested in this program should contact the chairperson, Dr. David E. Berry.

Medical Technology

Medical Technology is a challenging and rewarding profession for students interested in laboratory medicine. Working with pathologists and other physicians, the medical technologist is a vital member of the health team performing various medical laboratory procedures and providing the diagnostic assistance required in modern patient care. The medical technologist may also be employed in research or work in a variety of industrial settings.

Students spend the freshman, sophomore, and junior years at the University then apply for admission to the Mary Hitchcock Memorial Hospital for their senior year. After completing the required clinical courses, (Med. Tech. 761-766), the student is awarded 32 credits toward the Bachelor of Science Degree. Student costs for the senior year include a University charge of $800 and a maintenance charge of $1000 (includes room and board at the Mary Hitchcock School of Medical Technology). Upon successful completion of the program the student is awarded the B.S. degree and is qualified to take the Registry Examination administered by the Registry of Medical Technologists of the American Society of Clinical Pathologists.

Academic requirements for the program are as follows: 1) Students must obtain grades of C or better in Zool. 507,508, Micro. 503,702,705, Chem. 517-518, 545-546, Biochem. 656, and Med. Tech. 625, 720, 761-766. Also students must by the end of their sophomore year demonstrate an overall cumulative average of 2.5 as well as a 2.5 average in the required chemistry, zoology and microbiology courses. Evaluation of the student's academic performance and a personal interview conducted by UNH-Mary Hitchcock faculty are required before the end of the second semester of the sophomore and junior years.

Students interested in Medical Technology should consult with the Acting Chairperson, Ms. Karol LaCroix.

		Fall	Spring
Freshman Year			
Engl. 401	Freshman English	4	
Zool. 507-508	Hum. Anat. & Physiology	4	4
Chem. 403-404	General Chemistry	4	4
Math. 420	Fundamental Mathematics		4
Med. Tech. (401)	Intro. to Med. Tech.		0
Electives (2)*		4	4
		16	16
Sophomore Year			
Microb. 503	General Microbiology	4	
Microb. 702	Pathogenic Microbiology		4
Chem. 517	Quantitative Analysis	3	
Chem. 518	Quantitative Analysis Lab	2	
Chem. 545	Organic Chemistry		3
Chem. 546	Organic Chemistry Lab		2
Electives(4)		8	8
		17	17
Junior Year			
Bio. Ch. 656	Physiological Chemistry and Nutrition		4
Microb. 705	Immunology and Serology	4	
Med. Tech. 625	Clinical Microscopy	4	
Med. Tech. 720	Clinical Microbiology		4
Electives(3)		8	4
E.E. 620	Electronics & Instrumen.		4
		16	16
Senior Year†			
Med. Tech. 761(761)	Diagnostic Microbiology Methods	8	
Med. Tech.(762) 762	Clinical Hematology		6
Med. Tech. 763(763)	Clinical Immunology	4	
Med. Tech.(764) 764	Clinical Chemistry		8
Med. Tech. 765(765	Clinical Immunohemat.	4	
Med. Tech.(766) 766	Clinical Urinalysis		2
		16	16

*Students must select courses to satisfy the University General Education requirements.

†Senior year begins about Aug. 25, at the Mary Hitchcock School of Medical Technology. Individual rotations will vary. All students will complete sixteen credits each semester.

Nursing

Professional nursing is a service which requires commitment to and accountability in assisting individuals or groups to attain, maintain, and accept their optimal health states and is an essential component of the total health system. The practice of professional nursing is an intellectual and interpersonal process which includes nursing assessment, nursing diagnosis, nursing intervention, and evaluation.

The professional nurse functions as an advocate for the client and as a member of the health team. S/he shares and may coordinate and lead in planning for, implementing, and evaluating the health care of individuals and groups.

Students in the B.S. program in nursing will receive preparation in professional education with an emphasis on the humanities and social, physical, biological, and nursing sciences. The student, upon completion of requirements, will receive a Bachelor of Science degree and will be eligible to take state board examinations to become a registered nurse. The program is accredited by the National League for Nursing.

Graduates of this baccalaureate program will be prepared to assume beginning positions in professional nursing and to pursue graduate study in nursing. Baccalaureate education is the minimum preparation for the practice of professional nursing.

Hospitals and many community health-related agencies are used for learning experiences. Students are responsible for their own transportation to the clinical laboratories as well as for purchase of uniforms to be worn there. A physical examination and selected immunizations, at student expense, are required within six months prior to the first clinical nursing course.

The Department also designed and will implement an approach within the curriculum to enable registered nurses with diplomas or associate degrees to pursue on an outreach, part-time basis the B.S. degree with a major in nursing.

An RN applicant must meet the University admission requirement and hold licensure to practice as a registered nurse, and be legally domiciled in the state of New Hampshire and/or be regularly employed in the state of New Hampshire. The length of the program depends upon the individual's past educational experience, interest, and ability to achieve advanced placement.

All students will be required to achieve a minimum of C in each prerequisite course by the end of the sophomore year in order to continue in the program. A cumulative average of 2.5 in nursing courses is required.

Students interested in the nursing program should consult the Acting Chairperson, Professor Marguerite F. Fogg.

		Fall	Spring
Freshman Year			
Engl. 401	Freshman English	4	
Biochem. 501	Biological Chemistry	4	
Psych. 401	Intro. to Psychology	4	
Nurs. 402	Nursing		2
Health 400	Health-Human Values		4
Soc. 400	Introductory Sociology		4
Electives (3)		4	6-8
		16	16-18
Sophomore Year			
Zool. 507-508	Hum. Anat. & Physiology	4	4
Micro. 501	Public Health Microbiology	3	
Micro. 502	Public Health Microbiology Lab	1	
Sp. & Drama 402	Communications	4	
H.E. 525	Human Development		4
H.E. 575	Normal & Therapeutic Nutrition		4
Statistics	(See department for appropriate course)	4	
Elective			4
		16	16
Junior Year			
Nurs. 601	Nursing Process	6	
Nurs. 603	Nursing Process (Well Family		6
Nurs. 610	Nursing Process (Environmental Influences)	6	6
Nurs. 612	Nursing Process (Limited Disruptions)		
Electives (2)		4	4
		16	16
Senior Year			
Nurs. 621	Nursing Process (Complex Disruptions)	6	
Nurs. 625	Nursing Process (Complex Environmental Influences)	6	8
Nurs. 628	Nurs. Process (Man's Optimum Function)		
Electives (3)		4	8
		16	16

Occupational Therapy

The occupational therapist is a professional member of the medical and community health-care team. Through a systematic application of a knowledge of human functioning and of functional activity, the occupational therapist assists in the prevention and correction of physical, social, and emotional disabilities.

The current curriculum was fully re-accredited in 1972 by the American Occupational Therapy Association and the Council on Medical Education, American Medical Association. Two years of pre-professional study and two years of professional study constitute the prescribed program leading to the Bachelor of Science degree. The program includes theoretical studies in biological and medical sciences, in psycho-social science, in the evaluation of patient and activity, and in the planning and administration of treatment, as well as the development of practical skills in a wide range of therapeutic media. Preclinical observation and guided practice of patient treatment in local clinical situations are incorporated in the course requirements. Following completion of the four-year academic program, the student spends a minimum of nine months in supervised clinical practice. A certificate of completion of professional study is then awarded, and the student is certified as eligible to sit for the national certification examination.

Admission to the program is primarily at the freshman level. When enrollment permits, students may enter by declaration at the end of the freshman year or by transfer into the sophomore class.

A student must have achieved a 2.2 overall cumulative grade-point average by the end of the second semester of the freshman year to remain in the program. By the end of the spring semester of the sophomore year the student must have completed one one-week preclinical experience and have obtained a grade of C or better in Psych. 401, 561, 581; Zool. 507, 508; O.T. 510 and 512 in order to continue in the program.

Graduation requirements include successful completion of three one-week preclinical experiences, a 2.5 cumulative average in the courses prescribed in the major, and a grade of C or better in P.E. 606, 652; and O.T. 515, 581, 582, 583, 624, 633, and 634.

Upon satisfactory completion of the prerequisite courses the department will schedule a minimum of nine months of supervised clinical practice for each student. These field work experiences will be scheduled in centers which have established educational programs approved by this curriculum. The field work experiences are divided in three-month periods as follows: O.T. 711, General Medicine, Surgery, and Pediatrics; O.T. 712, Psychiatry; O.T. 713, Physical Disabilities and Rehabilitation. Students pay the field work experience fee (resident $95; non-resident $200) and register for these field work experiences prior to graduation. Owing to a scarcity of field work opportunities, the University will accept responsibility for scheduling field work experiences only once for each student.

the centers may provide maintenance but this cannot be assured. A physical examination with a tuberculin test is required prior to field work experience. Personal liability insurance must be purchased for the period of the pre-clinical and field work experience.

Eligible graduates make application for the June or January national certification examination through the department. A $50 fee is charged by the American Occupational Therapy Association for this examination.

Students interested in this program should consult the chairperson, Professor Ann Ury.

Freshman Year		**Fall**	**Spring**
Engl. 401	Freshman English	4	
Phych. 401	Introductory Psychology	4	
Psych. 581	Intro. to Child Behavior		4
Electives (5)		8	12
		16	16
Sophomore Year			
Soc. 500*	Social Psychology	4	
Zoo. 507-508	Human Anatomy & Physiol.	4	4
O.T. 400	Pre-Clinical 1	1	
O.T. 510	Occupational Therapy Theory 1		4
			2
O.T. 512	Treatment Media Analysis 1		
O.T. 531*	Group Process	2	
Arts 525*	Woodworking	4	
Psych. 561	Clinical Approaches to Human Behavior		4
			2
Elective			
		15	16

Junior Year		Fall	Spring
O.T. 515	Treatment Media Analysis II	4	
O.T. 581	Introduction to Medical Concepts	4	
P.E. 652	Kinesiology	4	
O.T. 582	Developmental Concepts in Rehabilitation Medicine		4
O.T. 583	Occupationa Therapy—Psychiatric Foundations		4
O.T. 588	Pre-Clinical II		1
P.E. 606	Neurology		4
Electives (2)		4	4
		16	17
June 1-August 30			
First Field Work Experience Appropriate to Student preparation (when scheduling permits		0	
Senior Year			
O.T. 624	Occupational Therapy Theory III—Psychosocial Treatment	4	
O.T. 633	Occupational Therapy Theory IV—Physical Dysfunction	4	
O.T. 634	Occupational Therapy Theory V—Advanced Physical Disablilities		4
O.T. 697	Organization & Admin.	2	
O.T. 698	Senior Seminar		2
Arts 519*	Weaving I		2
Electives (G.E.R.)		6	8
		16	16
Clinical Field Work Experiences			
O.T. 711 or	General Medicine, Surgery, and Pediatrics	0	0
O.T. 712	Psychiatry	0	0
O.T. 713	Physical Disabilities and Rehabilitation	0	0

*May be taken Pass/Fail.

Physical Education

The Department of Physical Education offers four areas of study for major students: 1) teacher certification, 2) exercise specialist in health maintenance, 3) pre-physical therapy, and 4) sports communication. Openings in Areas 2, 3, and 4 are limited and not open to entering freshmen.

The teacher certification program provides a specialized professional background and a broad general education. A student may pursue coursework to prepare as a generalist (all grade levels), or as either an elementary or secondary specialist in physical education. In addition to the above, students enrolled in the teacher certification program in physical education may elect to pursue an athletic training option. A cumulative grade-point average of 2.2 and a grade-point average of 2.5 in all physical education courses are required to be eligible for student teaching.

Students must earn a grade of C or better in each of the required physical education courses if majoring in any one of the following programs: 1) exercise specialist in health maintenance, 2) pre-physical therapy, 3) sports communication.

Students who wish to minor in Physical Education must complete 20 credits of coursework which have been approved by a department minor adviser.

Students interested in majoring or minoring in Physical Education should consult Chairperson, Professor Robert Kertzer.

Teacher Certification

Required Physical Education Courses		Credits
P.E. 470-477 478/479	Phys. Ed. Activities (for men & women)	
and one of the following:		
P.E. 445, 446, 447, 449, 520, 527		7.0
PE. 480-483, 485	Phys, Ed. Act. (for men)	2.5
P.E. 484, 486-491, S&D 460	Phys. Ed. Act. (for women)	3.5
One credit from the following:		
P.E. 410, 415, 416, 427, 428, 435, 437, 438, 439, 444. 445, 446, 449, 450. 453		1

One Course from the following:PE 411, 412 414, 417, 419, 420, 421, 422, 424		5
P.E. 500	Prin, of Phys. Ed.	4
P.E. 501	Adv. First Aid & Emer. Care	2
P.E. 620	Physiology of Exercise	4
P.E. 668	Measurement Procedures in Phys. Ed.	4
P.E. 775	Perceptual Motor Learning	4
One of the following:		
P.E. 563	Theory of Teaching Phys. Ed. in Sec. Sch.	4
P.E. 692	Theories of Teaching Phys. Ed. in the Elem. Sch.	4
One of the following:		
P.E. 625	Dynamics of Human Movement	4
P.E. 652	Kinesiology	4
Education Courses		
Ed 500	Exploring Teaching	4
Ed 700	Educational Structure & Change	4
Ed 701	Human Learning & Development	4
Ed 705	Alternative Perspectives on the Nature of Education	4
Ed 694	Supervised Teaching of Physical Education	8
University Required Courses		
H.S. 400	Health—Human Values	4
Psych 401	Introduction to Psych.	4
Zoo. 507-508	Human Anat. & Physio.	8

Athletic Training Option

This option has limited enrollment capacity and is open only to students enrolled in the physical education teacher certification program. Application for admission to the option is made through the department chairperson following completion of P.E. 502, but not later than the end of the sophomore year. In addition to the teacher certification program requirements, students admitted to the athletic training option must complete Home. Ec. 573, Human Nutrition, (in place of H.S. 400) and the following required courses:

Physical Education Courses		**Cr.**
P.E. 502	Basic Athletic Training	3
P.E. 610	Adapted Physical Education	4
P.E. 652	Kinesiology	4
P.E. 702	Advanced Athletic Training	4
P.E. 703	Lab. Prac. in Athletic Training	8
P.E. 780	Psychological Factors in Sport	4

Exercise Specialist in Health Maintenance

This curriculum prepares individuals for career opportunities with adult fitness programs in communities, industry, and health agencies. The exercise specialist works in physical activity programs of prevention, intervention, and cardiac rehabilitation. Required courses are:

Physical Education Courses		**Cr.**
P.E. major activities	(must include 475 and one of the following: 447, 520, or 527)	6
P.E. 501	Adv First Aid & Emerg. Care	2
P.E. 502	Basic Athletic Training	3
P.E. 620	Physiology of Exercise	4
P.E. 621	Exercise Lab. Techniques	2
P.E. 622	Therapeutic Exercise & Exercise Prescription	3
P.E. 650	Exercise Specialist Internship	8
P.E. 652	Kinesiology	4
University Required Courses		4
Psych. 401	Intro. to Psych.	
Psych. 561	Clin. Approaches to Hum. Behavior	4
Zoo. 507-508	Human Anat. & Physiology	8

Pre-Physical Therapy

The pre-physical therapy curriculum provides the necessary prerequisite course requirements for admission to a physical therapy certificate program. However, satisfactory completion of all UNH

degree requirements does not guarantee admission to one of the several physical therapy schools. In addition to the required courses listed below, work experience in a rehabilitation setting is highly recommended.

University Required Courses		
Chem. 403-404	General Chemistry	8
Physics 403-404	Intro. Physics for Biologists	8
Psych. 401	Intro. to Psychology	4
Soc. 500	Social Psychology	4
Zoo. 507-508	Human Anatomy & Physiology	8
One of the following:		
Psych. 531	Psychobiology	4
Psych. 561	Clinical Approaches to Human Behavior	4
Psych. 711	Sensation & Perception	4
One of the following:		
H.E. 525	Human Development	4
Psych. 581	Study of Child Behavior	4
One of the following:		
INER 528	Applied Statistics I	4
INER 701	Statistical Methods I	4
Psych. 601	Statis. & Method. in Psych.	4
Soc. 602	Statistics	4

Sports Communication

The sports communication option combines substantive knowledge in sport with skills in mass communication, including sportswriting and sportscasting. Required courses are as follows:

Physical Education Courses		Cr.
P.E. major activities		6
P.E. coaching courses		6
P.E. 633	Social Foundations of Sport & Physical Activity	4
P.E. 635	Contemp. Lit. in Socio-Cult. Aspects of Sport & Play	4
P.E. 668	Measurement Proced. in Phys. Ed.	4
P.E. 780	Psychol. Factors in Sport	4
P.E. 791	History of Phys. Ed.	4
University Required Courses		
Engl. 501	Intro. to Prose Writing	4
Engl. 621, 622	Newswriting	8
Engl. 703-704	Advanced Non-Fiction Writing	8
Engl. 795, 796	Independent Study	8
Psych. 401	Intro. to Psychology	4
Soc. 400	Introductory Sociology	4
S & D 403	Public Speaking	4
S & D 555	Intro. to Mass Communications	4

Recreation and Parks

The undergraduate program in Recreation and Parks prepares graduates for service in recreation administration and in park management. The courses of study in each area are designed to provide a base in the fundamentals of professional specialization and an exposure to the current leisure trends and needs of a rapidly changing economy and society.

Professional Curriculum Options

Professional options in Recreation Administration and Park Management are offered which lead to a Bachelor of Science degree in Recreation and Parks.

Students interested in this program should consult with the chairperson, Professor Gus C. Zaso.

Recreation Administration

This specialization is designed to identify and develop the abilities which will prepare the student for administrative and programming supervisory positions in the recreation fields. Students selecting this option are required to complete 128 credit hours for the degree

Freshman Year		Fall	Spring
Pol. Sci. 402	Amer. Nat. Gov.		4
Bio. 402	Man and His Environment		4
Res. Econ.411	Intro. to Res. Econ.	4	
R.P. 455	Intro. to Rec. and Park Serv.	4	
R.P. 457	Dynamics of Leadership & Prog.		4
			4
Electives (3)	GER	8	
		16	16
Sophomore Year			
Micro. 501	Public Health Microbiology	3	
Micro. 502	Public Health Micro. Lab.	1	
Pol. Sci. 631	Local Gov. and Politics	4	
Pol. Sci. 630	State Gov. and Politics		4
Res. Econ. 507	Intro. to Commun. Prob./I	4	
R.P. Elective (1)	Recreation and Parks		4
E.E. 432	Light; Sources and Uses		4
Electives (2)	GER	4	4
		16	16

Summer			
R.P. 564	Field Work	8	
Junior Year			
Adm. 517	Sur. of Manag. Act.	4	
Adm. 411 (411)	Behavior in Organizations		4
R.P. 663	Rec. and Park Admin.	4	
R.P. 667	Recreation Resource Plan.	4	
R.P. Elective (1)	Recreation and Parks		4
Electives (3)	GER	4	8
		16	16
Senior Year			
Pol. Sci. 731	Urban and Metro. Politics	4	
Pol. Sci. 730	Administrative Process		4
R.P. 771	Legal Aspects	4	
R.P. 798	Seminar in Leisure		4
R.P. 772	Financial Administration		4
E.E. 431	Speech, Music, and Noise	4	
		12	2

Park Management

This specialization is concerned with economics, planning, and supervision including the identification, acquisition and allocation, development, and maintenance of land and water resources for recreational purposes. Students selecting this option are required to complete 128 credit hours for the degree and are allowed very little flexibility in course electives.

		Fall	Spring
Freshman Year			
S.W. 504	Fresh Water Resources		4
R.P. 455	Intro. to Rec. and Park Serv.	4	
Res. Econ. 411	Intro. to Res. Econ.	4	
R.P. 454	Special Facility Operations		4
Electives (4)	GER	8	8
		16	16
Sophomore Year			
Micro. 501	Public Health Microbiolgy	3	
Micro. 502	Public Health Microbiology Laboratory	1	
Plant Sci. 522	Environ. and Plant Resp.		4
INER 581	Methods on Land Surveying	4	
R.P. 661	Rec. Res. Man.		4
R.P. Elective (1)	Recreation and Parks		4
Electives (3)	GER	8	4
		16	16
Summer			
R.P. 564	Field Work		8

Junior Year			
Admin. 517	Surv. of Managerial Acct.		4
R.P. 663	Rec. and Park Admin.	4	
R.P. 667	Rec. Resource Plan.	4	
R.P. 668	Designing and Engineering		4
R.P. 664	Safety and Security Oper.		4
Electives (3)	GER	8	4
		16	16
Senior Year			
INER 797	Forest Recreation Seminar	4	
INER 676	Economics of Water Use and Quality Management		4
INER 702	Natural Resources Policy		4
R.P. 771	Legal Aspects	4	
R.P. 798	Seminar in Leisure		4
Elective (1)	GER	4	
		12	12

Whittemore School of Business and Economics

Jan E. Clee, Dean
Stephen L. Fink, Associate Dean
Lawrence M. Horwitz, Assistant Dean
Thomas McCarron, Assistant to the Dean
Donald A. Moore, Director of
Center for Industrial and
Institutional Development
Virginia R. Tripp, Undergraduate
Counselor

Program Directors

Administration
George Miaoulis, Assistant Professor

Economics
William Hosek, Associate Professor

Hotel Administration
Mel Sandler, Associate Professor

Programs of Study

Bachelor of Arts
Economics

Bachelor of Science
Administration
Hotel Administration

General Information

Purpose and Programs

The Whittemore School of Business and Economics was established July 1, 1962, in consequence of the efforts of the late Laurence F. Whittemore, noted industrialist and long-time trustee and chairman (1955-60) of the UNH Board of Trustees. Since 1969 the School has been located in McConnell Hall, named for Dr. John W. McConnell, the fourteenth president of the University, 1963-1971.

The basic purpose of the undergraduate curricula in the Whittemore School is to combine the breadth of liberal education with the specifics of professional training in administration and economics. Undergraduate students enrolled in Whittemore School programs must take a substantial part of their coursework in other colleges in the University in order to fulfill the General Education requirements of the University. But beyond those, students are encouraged to elect additional courses in the arts, the behavioral and social sciences, the humanities, mathematics, and the natural sciences. Thus, students who complete the Whittemore School programs in administration, economics, and hotel administration are prepared for employment and graduate study in these and related fields.

Another purpose of the Whittemore School is to serve the needs of undergraduate students elsewhere in the University for whom selected courses in administration, economics, or hotel administration are relevant and desirable complements to their primary course of study. Most Whittemore School courses, therefore, are open to non-majors who have the prerequisite preparation.

Degree Requirements

The Whittemore School offers a Bachelor of Arts degree program in Economics and Bachelor of Science degree programs in Administration and Hotel Administration. Each candidate for a degree must satisfy all of the University General Education requirements for graduation as well as the particular requirements of each individual major program. Economics majors must also satisfy specific requirements associated with the Bachelor of Arts degree.(See page 17).

The curricula of the Whittemore School undergo timely revision and modification, and students are subject to and responsible for such changes as they are introduced. However, entering students may anticipate that a curriculum, as represented and as subsequently altered, can be completed in four academic years, assuming normal course loads are carried and normal progress is made. In sum, then, Whittemore School students generally follow the current catalog. New catalogs become effective on July 1 each year.

For information concerning advanced degrees, see the Graduate School catalog.

Advising System

Undergraduate advising in the Whittemore School is carried out jointly by an Undergraduate Counselor and the Faculty. The Undergraduate Counselor is located in the Dean's office where student academic records are kept. The Counselor assists students in program planning, preregistration, understanding and meeting academic requirements, and general academic and career decision making. The faculty draw on their experience, expertise, and interests to help students with course, program, and career selection.

Students are not officially assigned to faculty advisers, but are provided with a Whittemore School Faculty Profiles booklet, which contains considerable information about each faculty member's education and experience and current teaching and research interests. Students are encouraged to develop an advisory relationship with one or more faculty members on the basis of mutual interests. Students who prefer a more formally structured arrangement are urged to so inform the Undergraduate Counselor, and such an arrangement will be made with either the Associate or the Assistant Dean. All students are urged to seek as much assistance as they need, from whatever source, but are reminded that theirs is the ultimate responsibility for knowing and meeting the various academic requirements for a degree.

Independent Study

A junior or senior student in the Whittemore School may engage in independent study for from two to 12 credits. In order to pursue independent study, a student must secure a faculty sponsor in the area of interest, and submit to the Executive Committee of the Whittemore School prior to preregistration a plan of study which has the sponsor's approval. This submission is for information

purposes and does not require the following of any prescribed format. Nevertheless, such a plan of study should include a description of the academic objectives, a statement of the means by which they will be achieved, and a bibliography of materials where appropriate. Both the faculty sponsor and the Executive Committee will expect a proposal for independent study to be carefully prepared.

While independent study will ordinarily result in a term paper, proposals suggesting other outcomes will also be considered. Moreover, independent study may be substituted, by petition, for required course credits in the economics curriculum, and for elective course credits in the hotel administration curriculum.

Other Special Programs

A limited number of administration internships may be arranged by seniors in their final semester. Interns may earn up to 12 credits for a substantial project, usually undertaken with the cooperation of an off-campus organization or firm and a faculty sponsor. The project must involve the non-routine but practical application of skills and concepts acquired in the student's program. Such opportunities ordinarily must be found by students on their initiative. Details of the internship opportunity may be obtained from the Undergraduate Counselor.

For the last two academic years the Whittemore School has participated in the Small Business Institute program of the Small Business Administration. This provides 10-20 "cases" a year for teams of two students, usually seniors, to act as consultants to small businesses having difficulties and in need of assistance which well-trained students can supply. Students involved have uniformly reported the worthwhileness of the experience. Those interested in participating in the future may also obtain information from the Undergraduate Counselor.

Minor Program

A minor is not required for majors in the economics, administration, and hotel administration curricula. A student in any one of these curricula may, however, apply for permission to pursue a minor program of study in any discipline in which sufficient courses are offered at the University. Permission to participate in a minor program may be granted only by the Executive Committee of the Whittemore School with the concurrence of the particular department involved. Consideration shall be given to the student's major area of concentration and proposed minor before granting such permission. Successful completion of such a program is recorded on a student's academic transcript. See page 18 for requirements.

Administration Program

The Administration Program prepares young men and women for managerial or administrative careers in business or in public or private institutions.

Since most graduates of the Program elect to embark upon business careers, the major thrust is in that direction. However, as demand has grown in recent years for people able to apply businesslike methods to the problems of nonprofit institutions, such as hospitals, school systems, government departments, and other socially-oriented organizations, the Program's objectives have been broadened considerably to include all types of administration, rather than business only.

The curriculum offers professional education in the basic theories, principles, concepts, and analytical tools used by successful modern administrators, combining them with an introduction to some of the important functional areas of management. At the same time, the typical student achieves a well-rounded education by selecting courses in the liberal arts and the sciences from other colleges and schools in the University.

All students enrolled in the program must complete a five-course core of basic administrative tools and skills. Most students will then go on to take three prescribed courses in functional areas and two elective courses from administration or economics. Some students, however, will be permitted to fulfill the requirements of the program by building onto the core a specially designed package of five courses which suit the individual's needs and which may include only one or none of the functional area courses. Such a proposal needs the approval of the Administration Program Director. In either case, a student must achieve a grade-point average of at least 2.0 in the program in order to graduate. Transfer students must complete at least five courses toward the administration major while at UNH. In addition, credit toward the administration major

is not normally given for upper-level courses in this Program which are taken at the first- or second-year level elsewhere.

The internship opportunity is described above in "Other Special Programs."

Students not majoring or minoring in administration are encouraged to consider courses in accounting, organizational behavior, finance, marketing, production, etc. as relevant supplements to their own program of study. Advice concerning courses appropriate to various career goals may be obtained from members of the Administration faculty.

A suggested plan of study is given below:

Freshman and Sophomore Years
Econ. 402, Principles of Economics (Micro); Admin. 411, Behavior in Organizations; Admin. 424, Quantitative Analysis; Admin. 502, Financial Accounting

Junior and Senior Years
Admin. 650, Operations Management; Admin. 651, Marketing; Admin. 653, Financial Management; Admin. and / or Economics electives (2)

Semester II—Senior Year
Admin. 700, Management Policy

A minor in administration is available to students in the arts and sciences and in technical or professional programs who may want to become managers or administrators in their own fields, or who want to generally enhance their employability. The minor in administration consists of: Economics 402, or in some cases, Economics 401, but not both; Administration 411 and 424; and Administration 502 or 517, but not both; and two electives.

For more information about the minor, see the WSBE Undergraduate Counselor.

Economics

Economics is the study of the allocation of scarce resources among competing uses, either through use of conscious public policy ("planning") or through impersonal market forces, the maintenance of full resource use, and the distribution output. The analytical skills of the economist are useful in evaluating alternative methods of achieving these goals and in the formulation of new approaches to problems in these areas.

The Economics program is designed to introduce students to the tools of economic analysis and to an understanding of the areas they may be usefully applied to.

While undergraduate training in economics does not qualify students as professional economists (students intending such a career should plan on graduate study), it is regarded by employers as a highly desirable background for business or governmental employment. In recent years, economics graduates have competed on a favorable basis for business and government jobs with graduates in other areas, including administration. Undergraduate economics training is an excellent background for graduate work in law, business administration, and international relations, as well as economics.

Students planning to pursue graduate study in economics should consult with their advisers or faculty members early in the academic program to assist the student's selection of an appropriate graduate school and to aid in gaining admission.

Courses in economics, including a minor program, are open to non-majors. Students majoring in other programs may find certain economics courses useful supplements to their own majors and an aid in future employment. Political science majors may be interested in courses in Economic Development, Comparative Economic Systems, Public Finance, and Government Regulation of Business; Technology students, in Statistical Theory, Introduction to Econometrics, and Intermediate Microeconomic Analysis. Non-economics majors with questions about the nature of various courses should feel free to question members of the economics faculty.

Economics majors must complete eight full courses in economics with a grade of at least C- in each course and achieve at least a 2.0 grade average. These must include both intermediate theory courses, Economics 605 and 611. Students must also pass Economics 525, Introduction to Economic Statistics, and Mathematics 416 or equivalent courses as determined by the Economics faculty. (Students may petition to substitute one 600- or higher-level Administration or Resource Economics course for an Economics elective.) Major credit toward Economics 605 and/or 611 will be awarded transfer students only if such courses have been taken at

the junior level or above. Transfer students must take five of their eight economics courses at UNH. All Economics majors must satisfy the Bachelor of Arts degree requirements (page 17).

A suggested plan for the economics major is given below:

Freshman and Sophomore Years
Econ. 401, 402, Principles of Economics; Math 416, Mathematics for Business and Economics; Econ. 525, Intro. to Economic Statistics.

Junior Year
Econ. 605, Intermediate Microeconomic Analysis; Econ. 611, Intermediate Macroeconomic Analysis

Senior Year
Economics electives (3)

A minor in Economics consists of Econ. 401, 402; Econ. 605 or 611; and two Economics electives.

Hotel Administration

The objective of the Hotel Administration program is to prepare students to perform in managerial-level jobs in enterprises and institutions of the services sector of the economy which have major food service and lodging components.

The services sector includes lodging, food service, tourism and recreation industries, and institutions such as hospitals and schools.

In addition to the general education requirements of the University, students receive an extensive foundation in administration and economics. The Hotel Admistration courses complement coursework in these areas to provide the specialized knowledge needed for effective performance as managers.

Experience in and exposure to the services industry is provided by the following requirements:

1. One summer, or the equivalent, of approved on-the-job experience. A variety of work is desirable which should include experience in quantity food preparation.

2. Projects and work-observation periods in operations as an integral part of the courses in Lodging and Food Service and Institutional Management, Management of Physical Structures, and Markets and Promotion of Public Services.

3. Planning, marketing, preparation, and service of large-scale gourmet dinners as part of the course, Functional Management.

4. Attendance of a series of lectures by representatives of service-sector businesses and institutions.

Students in the Hotel Administration program must obtain a grade point average of 2.0 or better in the required courses given in the Whittemore School. A graduate of this program, who is qualified for and interested in further allied studies, is well prepared for advanced degree programs in business or institutional administration.

A suggested plan of study is given below:

Freshman Year
Hotel Administration 403, Elements of Institutional Administration; Administration 411, Behavior in Organizations; Economics 402, Principles of Economics (Micro)

Sophomore Year
Administration 424, Quantitative Analysis; Administration 517, Survey of Managerial Accounting; Hotel Administration 518, Financial Analysis and Control; Hotel Administration 556, Management of Physical Structures

Junior Year
Administration 651, Marketing; Hotel Administration 655, Lodging, Food Service, & Institutional Management

Senior Year
Hotel Administration 667, Functional Management; Hotel Administration 666, Markets & Promotion of Public Service

Pre-Professional, Interdisciplinary, and Experimental Programs

Teaching Learning Council

The Teaching Learning Council, an extraordinary committee established by the University Senate, is charged with encouragement of excellence and innovation in undergraduate teaching. To this end, the Council is exploring many approaches—colloquia, video-tape equipment, a Teaching Resource Center, and so on—which may lead to improvement in teaching.

In cooperation with the Teaching/Learning Committee in each of the University's colleges, the Council supports development of new approaches to teaching in existing or new courses, and promotes development of experimental and interdisciplinary courses and programs by faculty members and other qualified persons; such courses are publicized at preregistration time in the student newspaper. Courses under Council sponsorship are normally offered for one semester, though some have been repeated.

The Independent Work Study courses and the modular Introductory Stastics course are continuing offerings and are listed in the Course Descriptions, page 151.

The Student Designed Major

Under special circumstances students may design their own majors. This option is offered in response to the highly motivated and independently disciplined student who wishes a course of study which is not available through existing programs at the University. It allows the student, with the close supervision of a faculty member, to cross department and college lines, and to create educational experiences on and off campus as part of an individual program of study.

The program is administered by a committee of elected faculty which operates through the Office of the Vice Provost for Academic Affairs. Students who want to design their own majors are expected to give the committee evidence of careful thought and planning in a detailed proposal submitted before the middle of their junior year. Guidelines for this proposal are available in the Office of the Vice Provost for Academic Affairs.

Pre-Law

Students who intend to apply for admission to law school are not required to follow a specific undergraduate curriculum. There are goals which the student ought to pursue in the planning of the undergraduate experience. Law schools expect the student to follow a program of study which develops breadth of view, facility of expression, and analytical capacity. They urge the student to acquire a background of information concerning the society in which one lives, and the forces which have shaped modern institutions. The competent use and understanding of the English language in writing and speaking are essential acheivements for those who plan to attend law school.

Students should choose courses of study which allow them to develop the capacities specified. Specific course selection can be discussed individually by student and adviser, but some general guidelines may be offered. Helpful courses are those which develop skill in written and oral expression and those which deal with man's political, economic, and analytical thinking and provide an understanding of the human mind.

Students who hope to enter law school should contact a member of the University Pre-Law Committee to discuss courses of study and other matters related to admission to law school. Those who are considering taking the Law School Admission Test should schedule the examination in October or December of the senior year, and should discuss the examination with a member of the Pre-Law Committee before undertaking it. Members of the Pre-Law Committee are: Lawrence W. O'Connell, chairperson, Political Science Department; Richard V. Desrosiers, Spanish and Classics; John R. Kayser, Political Science; and Joseph Michael, WSBE.

Premedical-Predental Program

Students considering a career in medicine or dentistry should become familiar with the minimum course requirements as early as possible, so that specific courses needed for application to medical and dental schools can be incorporated into their programs. The premedical-predental option is not a major with a rigidly prescribed curriculum; rather, it is the acknowledgment of a student's professional intention. Although a majority of students in the past have elected zoology as a major, there is a trend, particularly in premedicine, away from exclusive concentration in a single area of science. In recent years students from UNH have chosen to major not only in sciences such as zoology, microbiology, biochemistry, and chemistry but also in such fields as history, English, psychology, and political science.

Each student will choose a major subject based on his or her own interests and aptitude and will be assigned an appropriate faculty adviser from that department or school. The responsibility of the Premedical-Predental Advisory Committee is to offer information about medical and dental admission requirements and procedures and to provide recommendations at the time of application.

All medical and dental schools expect applicants to have demonstrated ability in basic natural and physical sciences. Although the specific requirements for admission vary considerably, the following courses constitute a minimum in order that a student may be considered for admission: biological sciences, physics, general chemistry, and organic chemistry, all two semesters each with laboratory; and mathematics through calculus. Proficiency in English and a foreign language is strongly recommended. An appropriate group of courses from among the offerings at the University of New Hampshire would be the following: Zoology 412, (518); Physics 403-404 (or 407-408); Chemistry 403-404 and 651-652; and Mathematics 425, 426. Some dental schools require a semester of quantitative analysis (Chemistry 517) and are less demanding about a mathematics requirement.

Courses which qualify an individual for consideration as a premedical or predental student should be completed by the time the application to a professional school is submitted, usually at the end of the junior year. Inasmuch as the performance in these courses is weighted heavily by the admissions committees, it is strongly recommended that students not register for them under the pass-fail option.

Interested students should enroll with Professor Paul R. Jones, Chemistry Department, chairperson of the Premedical-Predental Advisory Committee, as early as possible.

Genetics

An undergraduate degree in Genetics is not offered at the University of New Hampshire. In the Graduate School, the M.S. and Ph.D. degrees are offered in an Interdepartmental Genetics Program. For courses offered in the Program, some of which may be taken by the undergraduate, refer to the Graduate Catalog. Undergraduates interested in preparing for graduate work in Genetics at UNH or elsewhere should contact the chairperson of the Genetics Program early in their undergraduate program for advice on courses which will aid in this preparation.

Interdepartmental Biology Major

The Biology major is designed with a common core curriculum from which options are available as follows: 1) preparation for teaching biology in secondary schools and 2) preparation for professional careers in biology and for graduate study. Completion of the four-year undergraduate program plus a fifth-year internship will be necessary for biology teacher certification.

Students are advised to declare the biology major as incoming freshmen to assure adequate program planning. The major is offered in both the College of Liberal Arts and the College of Life Sciences and Agriculture under the supervision of the Inter-College Biological Sciences Organization. Students wishing a more specialized program or who do not plan to teach secondary school should consider a major in Animal Sciences, Biochemistry, Botany, Entomology, Microbiology, Plant Science, or Zoology.

Major and supporting courses listed below should be taken in the sequence given. Students in the teaching option should enroll in Education 500 during their sophomore year, and take two additional education or science courses. Those not in the teaching option will instead take three advanced biological science or supporting courses. Graduation requirements include a 2.0 cumulative average in the courses prescribed in the major. Students majoring in one of the biological science departments may not minor in Biology.

Students interested in the Biology major should contact either Professor F.K. Hoornbeek or (for the teaching option) Ms. Gail Lumsden, Zoology Department, Spaulding Life Science Building.

Major course sequence

Note: Except for science courses, University general education requirements not included. (See General Education Requirements page 16.)

Freshman Year	
Sem. I	Bot. 411 or Zool. 412, Chem. 403, Math 425
Sem. II	Zool. 412 or Bot. 412, Chem. 404
Sophomore Year	
Sem. I	Chem. 545, Zool. 518, Biol. 541, Educ. 500*
Sem. II	Zool. 527, Bot. 566, Educ. 500* (if not taken Sem. I)

Junior Year	
Sem. I	Phys. 403, Micro. 503, advanced biology or supporting course†
Sem. II	Phys. 404, Bot. or Pl. Sci. 606, Education* or advanced biol. course/advanced biology or supporting course†
Senior Year	
Sem. I	Entom. 402 or Zool. 604, Education* or advanced bio. course/advanced biology or supporting course†
Sem. II	Pl. Sci. 604 or Entom. 402, Bot. 758

*for teaching option.

†for non-teacher option: substitution of Chem. 651-652 for Chem. 545, and the second semester of calculus (Math. 426) are suggested for graduate school preparation.

International and Foreign Area Studies Minor

This minor is designed to meet the needs of students who wish to pursue their studies with an international or an area focus. It provides an interdisciplinary support for the student's major interest. Students interested in this minor should consult the minor requirements in their respective colleges. The program will be administered by an International Studies Minor Supervisor.

A minor in International and Foreign Area Studies consists of 20 credits (normally five courses) and knowledge of a foreign language. Courses which may be applied toward this minor are listed in the Bulletin for International and Foreign Area Studies Minors available from the International Studies Minor Supervisor. For approval of the minor the student must meet the following requirements:

1. Complete a minimum of one and a maximum of two courses from a list of general international courses.

2. Select a foreign area from among the six offered (Asia, West Europe, Soviet and East Europe, Africa and the Middle East, Canada, Latin America) and complete a minimum of three and a maximum of four courses from among those listed for that area.

3. Demonstrate knowledge of a foreign language relevant to the selected geographic area. This requirement will ordinarily be met by either:

a. Successful completion of the following courses in a language relevant to the area: French 504, 506 or 514; German 502 or 508; Italian 504; Portuguese (see c below); Russian 502; or Spanish 504.

b. Successful completion of courses taught in the relevant language above the level of the courses listed in "a."

c. Certification by the language department concerned. Students who select an area in which no relevant language is currently being offered or students with a knowledge of a foreign language not offered in University language programs should contact the International Studies Minor Supervisor.

4. No more than two courses from any one department may be applied toward the minor.

5. With the approval of the International Studies Minor Supervisor, courses taken during the junior year abroad (Salzburg, Austria; Dijon, France; or Valencia, Spain) can be counted towards the minor.

For further information students may contact: Professor B. Thomas Trout, Department of Political Science, International Studies Minor supervisor.

Computer Courses

The University has a DEC System/10 computer with a number of teletype terminals located around the campus. Many science and engineering courses involve assignments which the student is expected to work out on the computer.

The Electrical Engineering Department offers courses and an option in Computer Engineering (page 58) and the Mathematics Department offers courses in computer science and numerical analysis. There is an interdisciplinary major in Mathematics-Computer Science described on page 62 of this catalog.

Marine Science and Ocean Engineering

The University is centrally located on the New England coast near a variety of estuarine, coastal, insular, and continental shelf marine environments. This ideal location has resulted in a long-standing history of educational and research activities which are currently being pursued within the areas of the marine life; physical and social sciences; ocean engineering; and chemical, geological, and physical oceanography considered in the context of the physical sciences. Supporting facilities include the Jackson Estuarine

Laboratory, the Shoals Marine Laboratory, the Engineering Design and Analysis Laboratory with its Diamond Island Ocean Engineering Station, the Mechanics Research Laboratory, the *R/V Jere Chase* and several smaller vessels.

Oceanography

Students who wish to prepare themselves for careers in oceanography should be well founded in the basic sciences. As a minimum, they should elect Chemistry 403-404, Mathematics 425-426, and Physics 407-408, depending on area of specialization. Students should also enroll as a major in one of the established science disciplines closest to the principal area of interest. Those students interested in chemical, geological, or physical oceanography should consult with Dr. Herbert Tischler, Department of Earth Sciences. Students with interests in the area of biological oceanography should contact Dr. Philip J. Sawyer, Department of Zoology; Dr. Arthur C. Mathieson, Department of Botany; or Dr. Galen E. Jones, Department of Microbiology. Usually additional work at the graduate level is necessary in the field of oceanography.

In addition to the courses necessary to attain a degree in a specific discipline, students should, in consultation with their advisers, consider some of the following courses which are available to undergraduates: 1) Botany: Marine Botany, Marine Phycology, Marine Algal Ecology and Micro-algae; 2) Earth Sciences: Introduction to Oceanography, Geological Oceanography, Physical Oceanography, Mineralology of Clays, Principles of Geochemistry, Chemical Oceanography, Sedimentation-Stratigraphy, Estuarine and Marine Sedimentation, Applied Geophysics; 3) Microbiology: Public Health and Sanitation, General Microbiology, Environmental Microbiology, Marine Microbiology, and Microbial Biogeochemistry; and 4) Zoology: Principles of Zoology, Ornithology, Principles in Genetics, Introductory Invertebrate Zoology, Comparative Endocrinology, Natural History of Marine Invertebrates (summer only), Marine Parasitology, Histology and Microtechnique, Fisheries Biology, Introduction to Marine Science (offered at the Isles of Shoals during summer only), and Principles of Ecology.

Cooperative Educational Programs in Marine Science

Two cooperative programs in marine science are offered titled "An Introduction to Marine Science."

One program is a cooperative summer offering with Cornell University and the State University of New York. It is a general introduction to marine science aimed primarily at undergraduates, and draws on the professional backgrounds of more than twenty-five faculty and nearly as many captains, fishermen, and others whose living is associated with the sea. Prerequisite: at least one full year of college biology. Daily lectures, laboratory, and field work are taught at the Shoals Marine Laboratory on Appledore Island in the Isles of Shoals. No formal examinations; grades are Cr or F; (credit or fail). Two sections of a four-week course in Introduction to Marine Science, Zoology 774 (5 credits) are taught each summer. Between the sections of this course, advanced courses are offered in Invertebrate Embryology (3 weeks, 4 credits), Field Phycology (3 weeks, 4 credits), Anatomy of the Gull (1 week, 1 credit), Research in Biology (1 to 5 weeks, 1 to 4 credits) and Underwater Research (1 to 2 weeks, 1 to 2 credits). For further information, contact the Marine Program Office, Kingsbury Hall, University of New Hampshire, Durham, N. H. 03824.

The second program is a multidisciplinary, team-taught course under the auspices of the New Hampshire College and University Council. Topics and units include: physical, geological, and chemical oceanography; biological oceanography; marine phycology; marine invertebrates; and field trips. Prerequisite: approval of the campus representative of the Marine Science Committee of the New Hampshire College and University Council. Fall and spring semester courses. The course meets on Saturdays only. Students interested in this program should enroll in Earth Science 503, Introduction to Marine Science (4 credits).

A series of field-oriented summer courses under Earth Science 603, Marine Science Summer Institute, will be offered by the New Hampshire College and University Council at the Robert S. Friedman Cobscook Bay Laboratory in Maine for the more advanced undergraduate student. The three-week courses will probably include marine geology, marine botany, marine ecology, marine chemistry, etc. Three three-week sessions are offered. The University of New Hampshire (Durham) representative is Dr. Theodore Loder of the Earth Science Department.

Ocean Engineering

Study and research in the application of engineering knowledge to the ocean and contiguous land environments are pursued by all four engineering departments of the College of Engineering and Physical Sciences. An Undergraduate Ocean Engineering Minor Program, composed of both lecture and project-type courses, is designed to prepare undergraduate engineering students for ocean-related employment after graduation or for graduate degree programs in ocean engineering. Successful completion of the program is certified on the students' transcripts. The details of the Ocean Engineering Minor Program are given on page 49.

The application of theory to the solution of real problems in the marine environment is an essential part of the undergraduates' education. It is achieved through student participation in the ocean research and project activities led by faculty associated with the College's Engineering Design and Analysis Laboratory (EDAL) and, from time to time, by individual faculty from any one of the four engineering departments: Civil, Chemical, Electrical, or Mechanical Engineering. EDAL is an interdisciplinary, ocean-oriented facility with its faculty representing the four engineering departments as well as related disciplines. Such an interdisciplinary orientation permits faculty and students to work on a broad range of socially pertinent and challenging ocean engineering projects. Ocean-associated activities of the Mechanical Engineering Department's Mechanics Research Laboratory focus on engineering mechanics applied to the solution of problems in the marine environment. Research funding is currently provided by the Office of Naval Research, the National Oceanic and Atmospheric Administration Sea Grant Program, the United States Coast Guard, and other government agencies as well as by the University of New Hampshire's Marine Program.

Persons interested in undergraduate ocean engineering activities are invited to contact any of the four engineering department chairpersons.

Consortium (NHCUC) Student Exchange Program

Under the Student Exchange Program of the New Hampshire College and University Council (NHCUC), UNH students may enroll for: one or two courses, one semester of courses, or a full year of course work at a member school, on a space available basis. Approval of UNH adviser and college dean is required. NHCUC schools include: Colby Sawyer College, Franconia College, Franklin Pierce College, Mount St. Mary College, Nathaniel Hawthorne College, New England College and its Arundel Branch in England (limited enrollment), New Hampshire College, Notre Dame College, Rivier College, St. Anselm's College, UNH, Keene State College, and Plymouth State College. Students will remain as degree candidates and continue to pay normal UNH tuition and fees but must make their own room and board arrangements if they plan to spend a full semester at another Consortium school. For more information and application forms, students should contact Mr. George Abraham, coordinator for the Exchange Program, Liberal Arts advising Center (Murkland Hall). Assistant Professor F. William Forbes (Spanish and Classics Department) is University Member of the Council's Cooperative Academic Programs Committee.

Associate in Arts in General Studies Degree

The Associate in Arts in General Studies degree gives students an opportunity to obtain a general, two-year college education; elect career-training coursework in several fields; and earn college credits in supervised work experience with cooperating employers.

The Division of Continuing Education designed the program to be equally accessible to both full- and part-time students. In doing so, the Division assures a wide range of University credit courses available during the late afternoon and early evening hours and during the daytime.

For full-time A.A. students, cooperative field work can mean alternating semesters of full-time study and full-time employment (with pay) in one of several careers. For part-time students who already hold full-time positions, it can mean an opportunity for new on-the-job experiences for college credit. Each field experience is arranged by the Division's career option coordinator on an individual basis, depending on student needs and the requirements of the employer.

The Associate in Arts degree can be complete in itself, or it can be a half-way mark toward a bachelor's degree. Credits earned as an A.A. degree candidate are transferable into related bachelor's degree programs at the University of New Hampshire and other colleges and universities.

Career Options

Within the Associate in Arts degree program, students may elect course work in one or more of the following concentrations:

Accounting Accounting is the second largest profession for men in the United States today, and in recent years many women have also taken advantage of the career opportunities in the field. Increasing government regulations—ranging from new tax laws to wage and price controls—require the expertise of a greater number of qualified accountants and auditors. This career option, offered in cooperation with New Hampshire College Portsmouth Center, provides students with the degree of specialization required to qualify for responsible jobs in accounting and will aid them in pursuing a more advanced degree at a later time in their careers. Required Accounting courses: Adm. 502, Adm. 503, and three accounting courses from New Hampshire College.

Banking The career coursework in the Banking option meets a need expressed by top-level banking management and associations for employees specifically trained in this field. Combined with the general education requirements of the A.A. degree program, these core courses give the student the knowledge and skills which top management is continually seeking. Students can supplement money-and-banking courses with electives in management, business law, accounting, and economics to obtain a solid business background. Required Banking courses: Cont. Ed. 440, 441, 540, and 533.

Criminal Justice A career in criminal justice is one of the most challenging occupations for men and women today. The orderly processes of the law make it possible for Americans to live in harmony and enjoy the personal freedom established under the Constitution. Careers in criminal justice extend beyond the "police beat." There are, for example, positions in various agencies of law enforcement at the municipal, county, state, and federal levels of government, and in private industry. This career option is offered in cooperation with the Department of Criminal Justice at St. Anselm's College. Required Criminal Justice courses: Cont. Ed. 550, 551, 552, and either Pol. Sci. 635 or two criminal justice courses from St. Anselm's College.

Insurance The core courses in the Insurance option can assist students who wish to qualify for an agent's and / or broker's license. A.A. graduates who complete the Insurance option may find a higher level of job entry and increased promotional opportunities with both large and small insurance firms. This career option may also be supplemented with electives in management to offer a solid educational background for individuals planning to start their own business. Required Insurance courses: Cont. Ed. 420, 421, and 422, and complete at least one from Cont. Ed. 531, 532, or 506.

Management Careers in management exist at many levels and this career option is designed to assist students to gain entry and promotional opportunities in the field. The career-training coursework emphasizes and develops the skills needed in management functions. Competent personnel at the assistant managerial level

will continue to be needed for business, sales, purchasing, personnel, accounting, and public relations, to name a few. Individuals now planning or running their own business will also find the practical emphasis of this career option very helpful. Required courses: Cont. Ed. 430 or Adm. 614; Cont. Ed. 431 or Adm. 411; complete two from Cont. Ed. 411, 432, or 532 (Small Business Management emphasis); or complete two from Cont. Ed. 432, 480, or 570 (Manufacturing Management emphasis); or complete two from Cont. Ed. 432, 530, or 532 (General Management emphasis, recommended for students without business experience); or complete eight credits from Cont. Ed. 432, Sec. 401-402, or Sec. 407-408 (Office Administration emphasis).

Merchandising Careers in merchandising represent a significant segment of New Hampshire's economy and many functions within the field require specific knowledge and skills. The career training coursework in Merchandising begins with the fundamentals and expands to specific techniques in promotion and advertising, retailing, and credit management. Employment opportunities exist not only in large industries but also in department stores, retail operations, discount stores, supermarkets, mail order operations, and smaller variety stores in the resort areas. Required Merchandising courses: Cont. Ed. 410, 411, 510, and 533.

Quality Control Personnel working with quality control function in an environment of increasing complexity. Innovations in technology and organization cause frequent changes in their job requirements. Such innovations, when properly understood and applied, make individuals more effective in their work and help them guard against technical obsolescence. The Quality Control degree option consists of coursework in quality control and management combined with a strong program in liberal arts. Required Quality Control Courses: Cont. Ed. 480, 580, 581, and 582.

Real Estate The career training coursework in the Real Estate option can help students who wish to qualify for a state license. A.A. graduates who concentrate on the Real Estate option may often find a higher level job entry and increased promotional opportunities with both large and small real estate firms. Supplemented with elective courses in management, this option can also offer a solid educational background for the individual planning to establish a business. Required Real Estate courses: Cont. Ed. 425, 426, 427; and complete at least one from Cont. Ed. 531, 532, or 506.

Recreation and Parks Careers in recreation and parks may be found in municipal, industrial, and church recreational programs; with state and federal agencies; in camping and outdoor education; with youth agencies; and on college and university campuses. The growing demand for services in leisure fields has created the need for additional manpower to staff the various leisure activities. Required R&P courses, administered by the Recreation and Parks Program within the UNH School of Health Studies: R&P 455, 663, 564; 457 and either 543 or 544 (Programming emphasis); or 661 and either 454 or 644 (Parks Management emphasis).

Secretarial Studies Secretarial skills will always be in demand for business, industry, government, and education. This career option trains the prospective secretary in the advanced skills necessary to compete successfully. In addition, the general education offered in the Associate in Arts degree program will help the secretary work more efficiently as an administrative assistant with competent understanding of current business, social, and cultural problems. A.A. graduates in this career option may enter the secretarial profession or pursue a higher degree at a four-year college of business. This option is offered in cooperation with McIntosh College in Dover. Required Secretarial Studies courses: Sec. 401-402, 407-408, and three related courses from McIntosh College.

Traffic and Distribution Management Rapidly rising costs and materials shortages have made product distribution one of the most complicated jobs in the business world today. The problems of energy conservation, cost consciousness, and operational efficiency have created a demand for managers who thoroughly understand the dynamics of physical distribution. This career option was developed to train prospective traffic and distribution managers and to improve the skills of those already employed in the field. Required Traffic and Distribution Management courses: Cont. Ed. 470, 570, 571, and 431.

Admissions Requirements

For the Associate in Arts degree program, the University accepts candidates who have a high school diploma or an equivalency certificate and who have demonstrated ability and motivation through: secondary school achievement, work experience, and/or military service. Because of the present limited residence hall capacity of the University, this program is available only to commuting New Hampshire residents. The state-residency requirement may be waived if the applicant is a full-time employee of a New Hampshire business.

Associate in Arts degree graduates are awarded a minimum of 64 credit hours upon entry into a UNH bachelor's degree program. Degree candidates wishing to continue their studies should consult with their advisers to assure that their planned programs meet the specific requirements for the selected major at the institution awarding the bachelor's degree.

Applications for admission may be obtained from the Office of Admissions, Thompson Hall. After being admitted to the A.A. degree program, candidates will be referred to a permanent adviser in the Office of Academic Counseling, Division of Continuing Education.

Degree Requirements

For degree requirements, see pages 17 and 18.

Academic Regulations

Associate in Arts degree candidates are subject to the academic requirements established by the University.

Pass-Fail While earning an Associate in Arts degree, the pass-fail option for grading may be carried in a maximum of two courses outside the courses required in the student's chosen career option. To use this option, an associate degree candidate must have completed a minimum of 16 credits at the University of New Hampshire on a regular graded basis of A to F. (See page 17.)

Financial Aid

Associate in Arts degree candidates are eligible for the full range of financial aid offered by the University. See Financial Aid, page 12.

Career Training Courses

The courses which constitute the core of the career options are drawn from: existing courses of the schools and colleges at the University, courses developed and sponsored by the Division of Continuing Education, and specialized courses offered by cooperating institutions of higher learning.

Because these career-training courses have different "homes," they are listed in different sections in the course descriptions. Courses designated by Cont. Ed. are listed under Division of Continuing Education Courses; Adm. courses are listed under Administration; R&P courses under Recreation and Parks; and Sec. courses under Secreterial Studies.

For information on courses offered by cooperating institutions, contact the Division of Continuing Education Office.

Counseling and Tutoring

Program planning and other counseling services are provided by the professional staff of the Division. Academic counselors are available from 8 a.m. to 5 p.m. daily and during evening hours on an appointment basis.

Tutoring services are also available for Division of Continuing Education students, including veterans under the provisions of the GI Bill.

For More Information

For further information on the Division's programs or services, write or visit the Division of Continuing Education, 6 Garrison Ave., UNH, Durham, N.H. 03824, (603-862-2015).

Thompson School of Applied Science

Lewis Roberts, Director

The Thompson School of Applied Science offers two-year, technical-level programs leading to an Associate in Applied Science degree. Instruction, a "learning-by-doing" educational approach, trains graduates for employment as technicians, professional assistants, supervisors, and mid-management personnel in industry, organizations, and agencies.

Programs currently offered include: 1) Applied Animal Science, 2) Applied Business Management, 3) Applied Plant Science, 4) Civil Technology, 5) Food Services Management, and 6) Forest Technology.

Thompson School graduates will have the necessary skills and experience to obtain satisfactory employment at the end of two years; they also have the option to continue their education at the baccalareate level. Most colleges accept Thompson School graduates at the junior-year level. Others, including most UNH baccalaureate programs, accept Thompson School graduates as second-semester sophomores.

Thompson School students are eligible for on-campus housing.

Admission Requirements

High school graduates are not required to be in the upper two-fifths of their graduating class. However, prospective students who lack real interest in the work covered by a particular curriculum, or who are unwilling to practice the necessary self-discipline required for satisfactory progress, should do some serious self-evaluation before deciding to apply.

High school applicants must take the College Board Scholastic Aptitude Test during their senior year. Applicants not high school graduates must be 18 years of age, have a minimum of two years of high school or its equivalent, and be able to demonstrate through aptitude tests their ability to handle course work. Applicants wanting to prepare for careers as Forest or Civil Technicians must present two years of college preparatory mathematics for admission.

For a Thompson School catalog and/or specific information write or call Director, Thompson School of Applied Science, UNH, Barton Hall, Durham, N.H. 03824 (603-862-1025).

Division of Continuing Education

Edward J. Durnall, Director
Carmita A. Murphy, Associate Director
Merna E. Johnson, Assistant Director, Academic Advisement
Margaret B. Erskine, Assistant Director, Conferences

The Division of Continuing Education provides access to higher education for New Hampshire residents under conditions which permit individuals to participate in University programs appropriate to their changing educational needs. These needs may at times be best satisfied through participation in workshops, conferences, short courses, or certificate programs—at other times by enrollment in credit courses and degree programs.

The faculty of the Division of Continuing Education are drawn from the teaching staffs of the University, from the faculties of neighboring colleges and universities, and from the ranks of business, professional, and community leaders who speak with authority in their respective fields of specialization.

In addition to the programs listed below, it is possible to complete many of the degree requirements in other areas of study offered by the University through enrollment in credit courses scheduled by the Division each semester.

Associate In Arts Degree

See Associate in Arts Degree Chapter.

Special Student Status

Special students—those who are not formally admitted into a degree program at the University of New Hampshire, Durham—may enroll in University credit courses each semester through the Division of Continuing Education.

All special undergraduate students are limited to 11 credits per term unless they obtain written permission of the Director of Admissions Thompson Hall. Special graduate students are also subject to enrollment limitations. Contact the Division for details.

Undergraduate courses Special students must meet one of the following requirements: have a high school diploma or its equivalent, or be at least 18 years of age.

Graduate courses Special students must hold a bachelor's degree or equivalent from an approved college or university.

Prerequisites All students are responsible for satisfying course prerequisites, if any. Instructors may require a student to withdraw from a course if the student is not adequately prepared for the level of work.

Short Courses and Minicourses

Throughout the year, the Division offers noncredit courses to the community. These courses may provide opportunities for individual development; or they may provide continuing educational services to business, labor, government, or the professions.

Short courses run for about 10 weeks, depending on course objectives, and typically offer individual or professional development.

Minicourses typically run for only five weeks and usually deal with recreational and other leisure-time interests.

Certificate Programs

Each certificate program consists of a specifically developed sequence of courses to provide a sound balance of theory, fundamentals, and specialized training. Certificates awarded by the Division have earned professional acceptance as evidence of increased knowledge in basic principles and techniques. Certificate programs offered include: Nursing Home Administrator Relicensure, Public Library Techniques (summers only), Banking, Health Care Administration, Insurance, Management, Merchandising, Quality Control, Real Estate, Traffic and Distribution Management, Apartment and Condominium Management, Data Processing, and Social Gerontology.

Conferences

The Division's Conference Department assists in planning and developing educational programs for groups and organizations. These programs range from one-day workshops and seminars to residential conferences and institutes lasting several days or weeks.

Throughout the academic year, the Conference Department makes full use of the facilities of the University of New Hampshire and the New England Center for Continuing Education adjacent to the campus, in conjunction with off-campus lodging for residential programs. During the summer months, the University's residence and dining halls are available to serve even the largest of groups. For more information, please contact the Conference Department, 862-2018.

Summer Session

Please see following chapter.

Course Charges

Students who enroll in credit courses through the Division pay on a per-credit basis, depending on residency status and course level. These course charges are listed in the DCE credit course schedule published prior to each semester. The course charges for noncredit courses and for conferences, workshops, and institutes vary according to the scope of individual programs.

Financial Aid

Course Charge Grants Special Students (non-degree candidates) who enroll in the Division of Continuing Education may be considered for grants in varying amounts, awarded on the basis of financial need and only for course charges in credit courses offered through the Division. Preference will be given to New Hampshire residents. Application for course-charge assistance must be filed with the Division at least one month prior to the start of classes for each term for which assistance is requested. Application forms are available from the Division Office.

Other Financial Aid For information on other sources of financial assistance, including Senior Citizen Scholarships, contact the Division counselors.

Class Schedule

While students may enroll in morning and afternoon classes through the Division, many courses offered each semester are scheduled in the late afternoon and early evenings to accommodate part-time students.

All courses offered by the University each semester are open to special students on a space-available basis. However, because UNH degree candidates have first priority in many classes, special students may not be assured space in certain classes until the first class meeting.

Division Publications

Specific information on course offerings, registration procedures, and academic requirements can be found in individual publications describing each program. For more information about the Division's programs, write: Division of Continuing Education, 6 Garrison Avenue, UNH, Durham, N.H. 03824 (603-862-2015).

Summer Session

Edward J. Durnall, Director

The University of New Hampshire offers students the opportunity to continue their studies on a year-round basis through four- and eight-week sessions during the summer months. The summer courses are the same high quality as those during the regular academic year and require the same level of academic performance.

Summer Session offerings include a full range of undergraduate and graduate credit courses in most of the major academic disciplines. Throughout the summer, classes are scheduled in the morning, afternoon, and evening.

Admission to Summer Session classes does not necessarily imply admission to degree candidacy.

Undergraduate courses are open to college undergraduate students, to interested members of the community who have a high school diploma or its equivalent or who are at least 18 years of age, and to high school students completing their junior or senior year (by permission of the Director).

Graduate courses are open to graduate students and other individuals with a bachelor's degree or its equivalent from an approved college or university.

Other Summer Session offerings include noncredit courses and certificate programs; workshops and seminars for business, industry, and the professions; and residential conferences and academic programs.

For more information A separate Summer bulletin is published each year in March and is available from: Division of Continuing Education, 6 Garrison Avenue, University of New Hampshire, Durham, N.H. 03824 (603-862-2015).

Graduate School

Raymond L. Erickson, Dean and Director of Research
William H. Drew, Associate Dean
Kenneth O. Freer, Assistant to the Dean

Master of Science
Animal Sciences
Biochemistry
Biology
Botany and Plant Pathology
Chemical Engineering
Chemistry
Civil Engineering
Earth Sciences
Electrical Engineering
Entomology
Genetics
Home Economics
Mathematics
Mechanical Engineering
Microbiology
Music Education
Natural and Environmental Resources
Physical Education
Physics
Plant Science
Zoology

Master of Arts
Economics
English
German
History
Music
Political Science
Psychology
Sociology
Spanish

Master of Arts in Teaching
Department of Education

Master of Science for Teachers
Chemistry
English
French
Mathematics
Physics
Spanish

Master of Occupational Education
Department of Occupational Education

Master of Business Administration
Whittemore School of Business and Economics

Master of Education
Department of Education

Master of Public Administration
Department of Political Science

Doctor of Philosophy
Biochemistry
Botany and Plant Pathology
Chemistry
Economics
Engineering
English
Genetics
History
Mathematics
Mathematics Education
Microbiology
Physics
Plant Science
Psychology
Sociology
Zoology

Graduate School

The Graduate School offers a wide range of programs leading to the master's degree and a number of programs leading to the Ph.D. degree. Graduate programs have been developed gradually and systematically with the goal of achieving academic excellence by careful utilization of institutional resources and regional opportunities. A highly qualified graduate faculty supervises graduate programs and establishes the requirements for admission and degrees which are administered by the Dean of the Graduate School.

Most graduate programs are relatively small and permit the student the opportunity to work closely with the faculty in the area of specialization. The aim of graduate programs is to offer high-level professional training in their respective disciplines and to provide opportunities for students to learn and practice sound research methods. Graduate students are expected to utilize fully the available opportunities and to demonstrate the maturity and self discipline necessary for sound scholarship.

A number of programs and facilities such as the Genetics Program, Jackson Estuarine Laboratory, Ritzman Animal Nutrition Laboratory, Center for Industrial and Institutional Development, Space Science Center, Resource Development Center, Water Resources Research Center, Engineering Design and Analysis Laboratory, Bureau of Educational Research and Testing, and Public Administration Service, provide opportunities to engage in interdisciplinary research.

Admission to the Graduate School may be granted to graduates of colleges and universities of approved standing, provided that the applicant's undergraduate record is satisfactory. An applicant's race, religion, color, national origin, or sex are not considered in the admissions process. The official application for admission and the Graduate Catalog containing detailed descriptions of graduate programs may be obtained from the Dean of the Graduate School, Social Science Center, UNH, Durham, New Hampshire 03824.

Financial Aid

Graduate Assistantships are available in most departments. These involve part-time work in connection with the University's instructional activities. University-sponsored awards, such as tuition scholarships, UNH Fellowships, Martin Luther King awards, and Dissertation Fellowships, are available to qualified students. A number of fellowship programs sponsored by such outside agencies as the National Science Foundation, Department of Health, Education and Welfare, U.S. Office of Education, and the U.S. Public Health Service may be available.

Merrimack Valley Branch

Roger Bernard, Dean

The Merrimack Valley Branch (MVB) of the University of New Hampshire offers credit and non-credit courses during the day and evening in Manchester, N.H. Classes are held at their new Hackett Hill Road campus and a high school in the city.

As an emerging campus of the University System of New Hampshire, the Merrimack Valley Branch strives to provide educational opportunities conducive to the fullest development of the individual learners; to allow each member of its community to create a definition of self which includes both the wisdom that comes with knowing and the wisdom derived from doing.

As the new campus develops, it will continue to be responsive to the local needs of the greater Manchester area with special emphasis on the needs of adult learners and Manchester area high school students not considering further education.

In order to achieve these goals, the Branch will assume the following major characteristics which will complement the existing University System's educational resources.

1. An open door admissions policy with the supporting staff necessary to assure motivated students the opportunity for success.

2. An innovative commuter college which will remove some of the financial barriers to educational opportunity for all.

3. A cooperative-education college whose paraprofessional educational programs will seek to instill a respect for both intellectual and physical work.

4. Two-year degree programs and continuing education programs geared to emerging career fields as well as complementing existing two- and four-year programs at other System campuses and local colleges, featuring interdisciplinary options and flexible curricula which encourage students to integrate careers and liberal education.

5. Educational and cultural programs responsive to the needs of Manchester while instilling consciousness of the important moral issues of the times affecting Manchester, New Hampshire, and the world.

Because of the diverse interests of its student body, the Merrimack Valley Branch has a special commitment to providing learning opportunities outside traditional degree programs. To meet this commitment, it is creating a comprehensive community services program which will include certificate courses, workshops, conferences, lectures, cultural events, and other learning experiences which use the rich resources of the Manchester metropolitan area and of its own specialized faculty. It will continue to complement these resources with those of the University of New Hampshire in Durham by transporting courses and expertise developed on that campus for the education and re-education of those specially interested in the broader base of learning associated with the University faculty. This combination of resources provides Manchester with non-degree learning opportunities which can satisfy the diverse demands of its citizens for learning.

Further information on courses and programs being offered at the Merrimack Valley Branch of UNH may be obtained by writing, visiting, or calling: the Merrimack Valley Branch, RFD 4, Hackett Hill Road, Manchester, N.H. 03102, (603-668-0700).

School of Continuing Studies

Maynard C. Heckel, Dean

The School of Continuing Studies (SOCS) was established as an alternative form of higher education for adult learners. As an academic unit of the University System of New Hampshire, SOCS is building flexible programs and making use of new and largely untapped resources for learning available in industry, agencies, and local communities. Specifically, SOCS is responsible for developing, expanding, and coordinating all off-campus educational programs of the System. SOCS draws upon: faculty resources of System institutions, qualified faculty members of other colleges and institutions in New Hampshire, and talented private citizens.

Bachelor of General Studies Degree The B.G.S. is deliberately designed to afford flexibility in several respects not provided for by traditional bachelor's programs. For example, some adults have assembled unique "packages" from a variety of disciplines, either to meet specific career requirements or to acquire a broad cultrual perspective. In some cases, the B.G.S. has been used as a foundation for graduate study.

Courses are offered at UNH in Durham, the Merrimack Valley Branch in Manchester, Plymouth State, Keene State, and statewide through SOCS. In addition, B.G.S. candidates are encouraged to take courses offered by New Hampshire's private colleges. The Program has no specific time requirements. Once formally accepted, the candidate is considered a student in SOCS.

Career or concentrated-study areas can be designed collaboratively with various groups, organizations, agencies, and companies. Whenever possible, these career options can be offered on-site.

Maturity gained through work and life experiences enables adult learners to design, with professional assistance, programs specific to career or personal goals. Credits earned through technical, vocational, and/or professional training are recognized as the cornerstone upon which academic programs can be built. Admission requirements are listed in the School's bulletin.

The School also offers courses which may be applied to the Associate in Arts degree and has a cooperative associate-degree program with the Vocational-Technical College in Berlin, N.H.

The SOCS calendar is flexible and may vary from University System calendars.

For further information contact the School of Continuing Studies, Taylor Hall, UNH, Durham, N.H. 03824.

Degrees and Major Programs of Study

College of Liberal Arts

The Teacher Education division of the College of Liberal Arts coordinates the 5-year graduate / undergraduate teacher education program. See Page 21.

Bachelor of Arts

Anthropology
The Arts
- Studio
- Art History

Classics
Communications
English
English Teaching
French
Geography
German
Greek
History
Humanities
Latin
Linguistics
Microbiology
Music
- Music History
- Performance Study
- Music Theory

Philosophy
Political Science
Psychology
Social Service
Sociology
Spanish
Theater
Zoology

Bachelor of Science

Biology
Music Edcuation*

Bachelor of Fine Arts

Bachelor of Music

- Piano
- Organ
- Voice
- Strings, Woodwind, Brass, or Percussion
- Theory
- Music Education

College of Life Sciences and Agriculture

Bachelor of Arts

Botany and Plant Pathology
Entomology

Bachelor of Science

Agricultural Engineering†
Animal Sciences
- Animal Science
- Dairy Science
- Poultry Science
- Pre-Veterinary Medicine

Biochemistry
Biology
Botany and Plant Pathology
Entomology
General Studies
Home Economics
- Preschool Education
- Secondary Home Economics Education
- Family Services
- Consumer Services
- Home Nutrition and Dietetics

Occupational Education
Plant Science

*Program is being phased out. Students are advised to consider Music Ed. option under the Bachelor of Music.

†First two years at UNH; Second two years at University of Maine

Institute of Natural and Environmental Resources
- Community Development
- Environmental Conservation
- Forest Resources (B.S. in Forestry)
- Hydrology
- Resource Economics
- Soil Science
- Wildlife Management

Bachelor of Science in Forestry

Thompson School of Applied Science

Associate in Applied Science

Animal Science
Business Management
Plant Science
Civil Technology
Food Services Management
Forest Technology

College of Technology

Bachelor of Arts

Chemistry
Chemistry and Physics Teaching
Earth Science Teaching
Geology
Mathematics
Physics
Science
- Physics
- Chemistry
- Earth Sciences
- Mathematics

Bachelor of Science
Chemical Engineering*
Chemistry*
Civil Engineering*
Electrical Engineering*
Geology*
Mathematics*
Mathematics-Education*
Applied Mathematics*
Mechanical Engineering*
Physics*

Bachelor of Engineering Technology

School of Health Studies

Bachelor of Science
Communications Disorders
Health Studies
Medical Technology
Nursing
Occupational Therapy
Physical Education
Recreation and Parks

Whittemore School of Business and Economics

Bachelor of Arts
Economics

Bachelor of Science
Administration
Hotel Administration

*Designated degree

Division of Continuing Education

Associate in Arts in General Studies
Career Options:
- Accounting
- Banking
- Criminal Justice
- Insurance
- Management
- Merchandising
- Quality Control
- Real Estate
- Recreation and Parks
- Secretarial Studies
- Traffic and Distribution Management

The Graduate School

Master of Science

Master of Arts

Master of Arts in Teaching

Master of Science for Teachers

Master of Occupational Education

Master of Business Administration

Master of Education

Master of Public Administration

Doctor of Philosophy

Description of Courses

Department Abbreviations

The following abbreviations are used to identify undergraduate and graduate programs offered at the university. An asterisk preceding the letters identifies those departments which offer graduate programs.

College of Liberal Arts

ANTH	Anthoropology
ARTS	Arts
BIOL	Biology
CLAS	Classics
*EDUC	Education
*ENGL	English
*FREN	French
GEOG	Geography
*GERM	German
GREK	Greek
*HIST	History
HUMA	Humanities
ITAL	Italian
LATN	Latin
*MICR	Microbiology
*MUSI	Music
*MUED	Music Education
PHIL	Philosophy
*POLT	Political Science
*PSYC	Psychology
RUSS	Russian
SCSC	Social Science
S S	Social Service
*SOC	Sociology
*SPAN	Spanish
SPDR	Speech and Drama
*ZOOL	Zoology

School of Health Studies

COMM	Communications Disorders
SHS	Health Studies
MEDT	Medical Technology
NURS	Nursing
OT	Occupational Therapy
PHED	Physical Education
RECP	Recreation and Parks

Division of Continuing Education

DCE	Career Options

Merrimack Valley Branch

MVB	Library Science

College of Life Sciences and Agriculture

*ANSC	Animal Science
*BCHM	Biochemistry
*BOT	Botany and Plant Pathology
*ENTO	Entomology
*FORS	Forest Resources (INER)
*HEC	Home Economics
*INER	Institute of Nat. & Envir. Resources (INER)
*OCED	Occupational Education
*PLSC	Plant Science
*RECO	Resource Economics (INER)
*S WS	Soil and Water Science (INER)

College of Engineering and Physical Sciences

*CH E	Chemical Engineering
*CHEM	Chemistry
*CI E	Civil Engineering
*ESCI	Earth Science
*E E	Electrical Engineering
ET	Engineering Technology
*MATH	Mathematics
*M E	Mechanical Engineering
*PHYS	Physics
*ENGR	Ph.D. Engineering
TECH	Technology non-departmental

Whittemore School of Business and Economics

*ADMN	Administration
*ECON	Economics
HOTL	Hotel Administration
SECR	Secretarial Studies

Separate Departments and Programs

AERO	Aerospace Studies
*GEN	Genetics Prgram
INCO	Intercollege
MILT	Military Science

Thompson School of Applied Science

TSAS

Explanation of Arrangement

The title and the Arabic numeral designate the particular course. Odd numerals indicate courses normally offered in the first semester; even numerals indicate courses offered in the second semester. ( ) around a course number indicates that it is offered out of sequence i.e., (401) would be offered second semester. The course description is followed by the prerequisites, if any, and the number of semester credits the course will count in the total required for graduation. Laboratory periods are usually two and one-half hours in length, lectures either 50 minutes or 80 minutes in length.

Cr/F following the description indicates that the course carries no letter grade, being marked Cr for credit, F for failure.

All courses (unless otherwise marked) are open to students who have passed the prerequisites. An elective course may be given only when there is a minimum of five students registered.

If the course numerals are connected by a hyphen, the first semester, or its equivalent, is a prerequisite of the second semester. If the numerals are separated by a comma, properly qualified students may take the second semester without having had the first.

Students must register for the number of credits or within the range of credits shown in the catalog description of a course.

The system of numeric designation of courses is as follows:

200-299	Courses in the Thompson School of Applied Science.
300-399	Non-credit courses, e.g., Mathematics 301.
400-499	Introductory courses not carrying prerequisites and courses generally falling within University and College requirements.
500-599	Intermediate-level courses for undergraduate credit only.
600-699	Advanced-level undergraduate courses. Entrance to courses numbered 600 and above normally requires junior standing. (Under some conditions these courses may be taken for graduate credit by non-majors only.)
700-799	Advanced-level undergraduate courses. (These courses may be taken for graduate credit.)
800-899	Courses which carry graduate credit only. (Descriptions will be found in the Graduate School catalog.)

Administration (ADMN)

Program Director: George Miaoulis

PROFESSORS: Carroll M. Degler, emeritus; Arthur W. Johnson, emeritus; Donald Marschner, emeritus; Robert F. Barlow, Jan E. Clee, John A. Beckett, Stephen L. Fink, Herman Gadon, James O. Horrigan, John Korbel, Dwight R. Ladd, Robin D. Willits, Dwayne Wrightsman

ASSOCIATE PROFESSORS: Allan Braff, Dale G. Broderick, Allan R. Cohen, Russell Haley, R. Stephen Jenks, Richard L. Mills, Mel Sandler, Barry Shore, Linda G. Sprague, William E. Wetzel, Jr.

ASSISTANT PROFESSORS: John M. Burt, Jr., John R. Haskell, Fred Kaen, George Miaoulis

INSTRUCTORS: Dean Plager, Donald D. Wells

LECTURERS: Clyde R. Coolidge, Lawrence Horwitz, Natasha Josefowitz, Tom McCarron, Joseph Michael, Harry Noel, Maryanne Sharer

411 (411). BEHAVIOR IN ORGANIZATIONS
Application of behavioral science concepts at work. Individual behavior, interpersonal relations, small groups, relations between groups—all in the context of a larger organization. Class treated as a real organization; students study own roles, norms, rewards, and leadership and take responsibility for the effects of their behavior on learning. 4 cr.

(424) 424 . QUANTITATIVE ANALYSIS
Elementary survey of quantitative methods for decision making; collection, summarization, presentation, and evaluation of data; probability and inference. Sufficient quantitative background provided for all other required undergraduate administration courses, but not for upper-division electives in quantitative methods in the Whittemore School. 4 cr.

(502) 502. FINANCIAL ACCOUNTING
Concepts, procedures, and tools of analysis in selection, quantification, and communication of economic events affecting financial condition and progress of organizations. (Not open to students who have had Continuing Education 460.) 4 cr.

503 (503). ACCOUNTING: PLANNING AND CONTROL
Analytical tools and concepts employed by managers for financial planning and control. Prerequisite: Admin. 502. 4 cr.

517 (517). SURVEY OF BASIC ACCOUNTING
Concepts, conventions, and processes in financial and cost accounting. Usefulness and limitations of accounting data in decision making and in analyses of past results. (For students minoring but *not* majoring in administration. Not open to students who have had Continuing Educ. 460.) 4 cr.

530. PERSONAL FINANCE AND INVESTMENT
Principles and practices of personal finance and investment. Investments in real estate, stocks and bonds, money-market instruments, savings accounts, and insurance and retirement plans. Personal saving, mortgages, consumer credit, and other means of financing investments. No credit toward a major or a minor in administration. 4 cr.

561. INTRODUCTION TO MANAGEMENT THOUGHT
Thinking-processes that underlie management and administration; survey of human thought, history of management thought, and prevailing contemporary models of the management process. Suitable background for all upper division administration courses. 4 cr.

602. VALUES IN A MANAGERIAL SOCIETY
Processes by which managerial values are formed and modified. 18th century ideas such as pursuit of self-interest, desirability of material progress, and individualism are attitudes which have loomed large among our American values; how these ideas relate to our present managerial society; some emerging alternatives to these long-accepted values. Case discussions and readings, lectures. Prerequisite: Admin. major or permission of instructor.4 cr.

(614) 614. ORGANIZATIONAL THEORY
Characteristics of formal organizations. Theory and concepts useful for analysis and administration of various types: business, educational, medical, social. Case discussions, class exercises, fieldwork. Prerequisite: Admin. 411 or permission of instructor. 4 cr.

642. MANAGEMENT INFORMATION SYSTEMS
Concepts, design, and implementation of management information systems. 4 cr.

647-648. BUSINESS LAW I, II
Law of contracts, agency, sales, negotiable instruments, real and personal property, partnership and corporations, with application of the Uniform Commerical Code. Prerequisite: at least junior status and permission of instructor. 4 cr.

(650) 650. OPERATIONS MANAGEMENT
Analysis of operational problems in the product and service sectors; standards, capacity, inventory, scheduling, and control. Prerequisites: Admin. 424 and 502, or permission of instructor. 4 cr.

651 (651). MARKETING
Marketing behavior of the firm as it supplies goods and services to consumers and industrial users. Optimal blending of ingredients in the "marketing mix": product pricing, promotion, preliminary consumer behavior, marketing research, and selection of distribution channels. Prerequisite: Econ. 402 or permission of instructor. 4 cr.

653 (653). FINANCIAL MANAGEMENT
The firm's uses and sources of funds; working-capital management; capital budgeting; and administration of debt and equity. Prerequisite: Econ. 402 and Admin. 502, or permission of instructor. 4 cr.

695-696. INDEPENDENT STUDY
Individual projects of special interest and benefit. Prerequisite: permission of Undergraduate Counsellor and proposed project supervisor; granted only to students with unusual initiative. Variable 4-12 cr.

(700) 700. BUSINESS POLICY
Capstone course, interrelating and applying specialized courses; cases of companies, firms, supplemented by economic and other information from published industry, company, and other sources. Prerequisite: Admin. major with senior standing. 4 cr.

705. OPERATIONS RESEARCH
Synthesis and analysis of mathematical decision models; mathematical programming, networks, inventory, queuing, scheduling, and Markovian models. Prerequisite: permission of instructor. 4 cr.

(712) 712. ORGANIZATIONAL CHANGE
Process of change in organizations. Change strategies; the change agent's role and relation to the client system. Bases of resistance to change and problems encountered by internal and external change agents. Theoretical reading material, cases, and exercises. Prerequisite: permission of instructor. 4 cr.

713 (713). INTERPERSONAL AND GROUP DYNAMICS
Dynamics of small groups through the use of the class itself as an intensive laboratory study group. Students examine their own behavic and its effects on others through use of the Laboratory Training Group (T-group), and develop conceptual ability and behavioral skills. Readings in group dynamics, interpersonal relations, and sensitivity training. Prerequisite: permission of instructor. Lab fee. 4 cr.

714. CONFLICT MANAGEMENT
Conflict among individuals, small groups, and organizations. Analysis of cases, readings, simulations, and roleplays (often using videotape) develops useful concepts and skills for dealing with conflict. Students examine their own behavior in coping with conflicts within the class. Field project required. Prerequisite: permission of instructor. 4 cr.

717. ADVANCED FINANCIAL ACCOUNTING
Theory and practice as they contribute to the significance and limitations of the financial statements. Prerequisite: permission of instructor. 4 cr.

718. COST AND MANAGEMENT
Effective use of cost accounting, cost analysis, and budgeting in planning and controlling operations. Analysis of cost behavior, direct and absorption costing, cost-price-volume relationship, distribution costs, transfer pricing, and capital expenditure analysis. Prerequisite: permission of instructor. 4 cr.

720. AUDITING
The attest function, and the responsibility and professional ethics of the independent auditor in our society. Audit concepts, procedures, objectives, and reports. Operational audits, social audits, and management services. Prerequisite: Admin. 717 or permission of instructor. 4 cr.

722. ACCOUNTING SEMINAR
Special topics. Prerequisites: Admin. 717 or 718, depending on topics, and consent of instructor. 4 cr.

728. STATISTICAL DECISION-MAKING
Probability and statistics applied to decision problems. Bayesian approach to decisions under uncertainty, which explicitly injects prior judgements of decision-makers and the consequences of alternative actions. Prerequisite: Admin. 424 or equivalent. 4 cr

730. INVESTMENTS ANALYSIS
Capital market patterns and techniques useful for security analysis. Securities, market institutions, yield series, random walks, intrinsic-value analyses, and portfolio management. Security analysis research projects. Prerequisite: permission of instructor. 4 cr.

732. EXPLORATION IN ENTREPRENEURIAL MANAGEMENT
Past and probable future role of the entrepreneur in the economic and social development of the U.S. Differences between entrepreneurial and administrative management. Mythology of the "American Dream," entrepreneur as a change agent, entrepreneurial motivation and behavior patterns, venture-capital markets, and role of the entrepreneur in non-profit institutions. Prerequisite: permission of instructor. 4 cr.

741. TRANSPORTATION
Problems of American transportation system. Economic structure of transportation industries; competition among the several modes. Public policy questions: merger, cost-benefit analysis of facilities, for example. Freight transportation; problems of passenger transportation, especially in urban areas. Prerequisite: permission of instructor. 4 cr.

745. INTERNATIONAL BUSINESS
Issues and problems confronting managers in the international economy. Emphasis on problems of working across national borders rather than on those encountered within the framework of different national economies, cultures, and institutions. For managers working in a multinational enterprise. Prerequisite: permission of instructor. 4 cr.

747 (747). FEDERAL TAXATION
Current federal-income, estate, and gift taxes and their impact on corporations, partnerships, and individuals. Tax analysis and decision-making. 4 cr.

750. MARKETING MANAGEMENT
Practical application of theories taught in Admin. 651. Planning, organization, and control of marketing activities in large corporations and small businesses; new-product development; pricing policies; selection of channels of distribution; interrelationships between marketing, production, and finance. Sound policy formulation and decision making established through analysis of cases and computer simulation. Prerequisite: a basic marketing course. 4 cr.

751. ADVERTISING AND PROMOTION
Advertising, personal selling, and other promotional tools to help solve marketing problems; advertising as a medium of communications and as a social-cultural force in the Western world. Prerequisite: Admin. 651 or permission of instructor. 4 cr.

752. MARKETING RESEARCH
Identification, collection, and analysis of data for the marketing process. Strengths, limitations, environment, and evaluation of research in the marketing process. Prerequisite: Admin. 424 and 651 or their equivalent. 4 cr.

754. CONSUMER BEHAVIOR
Consumer-firm relationship; concepts from contemporary social science findings, particularly small group studies. Learning, memory, cognition, motivation, emotion, perception concepts and global models related to present and prospective marketing activities of a business organization. Prerequisite: Admin. 651 or permission of instructor. 4 cr.

755. ADVANCED BUSINESS FINANCE
Development of analytical tools and practical skills for recognizing and solving complex problems of business finance. Working-capital management, capital budgeting, cost of capital, capital structure, and dividend policy. Prerequisite: Admin. 653 or 806. 4 cr.

756. MANAGEMENT OF FINANCIAL INSTITUTIONS
How financial institutions manage their sources and uses of funds; impact of external environmental factors upon the operation and performance fo financial institutions. Optimal portfolio strategies for commercial banks, savings and loan associations, mutual savings banks, insurance companies, and pension funds. Implications of monetar theory for individual financial institution policies; credit analysis; competition among financial institutions; regulation of financial institutions. Prerequisite: Admin. 653 or 806. 4 cr.

770. PERSONNEL ADMINISTRATION
Role of personnel administration and human resource management in achieving goals in "for-profit" and "not-for-profit" organizations. Functions of management; scope, technique, and current issues of personnel administration; organization of personnel activities and staff. How managers relate to personnel administration and interact with personnel administration staff and services. Prerequisite: permission of instructor. 4 cr.

798. SEMINAR IN ADMINISTRATION
Special topics; may be repeated. Prerequisite: consent of adviser and instructor. Variable 1-4 cr.

Aerospace Studies (AERO)

PROFESSOR OF AEROSPACE STUDIES: Colonel John J. Harrington, USAF
LECTURERS: Capt. Kenneth F. Calabria, Capt. Gary T. Grieshop
ADMINISTRATIVE: TSgt. Joseph A. Gallagher, SSgt. George C. GirouxJr. Staff Sergeant Jeffery L. Shriver,USAF

415. ORGANIZATION FOR NATIONAL SECURITY I
The U.S. Air Force and its role in relation to the other armed services and to civilian control of the military. 1 cr.

416. ORGANIZATION FOR NATIONAL SECURITY II
The major Air Force commands and the roles of separate operating agencies; organization, systems, and operations of strategic defenses; general-purpose aerospace support forces. 1 cr.

541. EVOLUTION OF MANNED FLIGHT I
From its beginning through WW II. The concepts of air power; research and technological change; events and elements in the history of air power and their impact on strategic thought. 1 cr.

542. EVOLUTION OF MANNED FLIGHT II
From the post WW II era to the present. 1 cr.

651. NATIONAL SECURITY FORCES IN CONTEMPORARY AMERICAN SOCIETY I
(Given as Political Science 673, the Foreign Policy Process of the U.S.) 4 cr.

652. NATIONAL SECURITY FORCES IN CONTEMPORARY AMERICAN SOCIETY II
(Given as Political Science 776, Strategy and National Security Policy.) 4 cr.

661. MANAGEMENT OF DEFENSE RESOURCES
Theory and practice; information systems, quantitative approaches to decision-making, and control techniques. 4 cr.

662. LEADERSHIP IN THE DEFENSE ENVIRONMENT
The meaning of military professionalism and the responsibilities and role of the profession and professional officer; development of leadership skills; discussion of the military justice system. 4 cr.

Animal Sciences (ANSC)

Chairperson: Winthrop C. Skoglund
(Animal, Dairy, Poultry, Pre-veterinary)

PROFESSORS: Kenneth S. Morrow, emeritus; Richard C. Ringrose, emeritus; Nicholas F. Colovos, emeritus; C. Hilton Boynton, emeritus; Winthrop C. Skoglund, Fred E. Allen, Walter M. Collins, William R. Dunlop, Harry A. Keener, Samuel C. Smith, Richard G. Strout
ASSOCIATE PROFESSORS: Alan C. Corbett, Thomas P. Fairchild, James B. Holter, James O'Connor Jr., Gerald L. Smith, Larry Stackhouse
ASSISTANT PROFESSORS: Frank Repka, Charles Schwab, Thomas Wight
LECTURERS: Dwight Barney, Linda Bland, Janet C. Briggs, Elizabeth C. Smith

400. ANIMALS, FOODS, AND MAN
Historical, biological, economic, social and political role of animals, and foods derived from them, in the evolution of civilizations and societies composed of man as a biological entity. Open to all students. Mr. S. C. Smith. 3 lec/1 guest lec/4 cr.

401. INTRODUCTION TO THE ANIMAL SCIENCES
To acquaint the beginning student with the development, economic importance, and problems of the livestock industry; the commerically important classes of farm animals; and the place of the biological sciences of animal agriculture. Mr. Skoglund, staff. 3 lec/1 lab/4 cr.

402 (402). HORSEMANSHIP
For beginning, intermediate, and advanced riders, riding instruction on University-owned horses. Limited number of students may stable their horses at the University. $80 fee. Ms. Briggs. 1 lec/3 hours of riding/2 cr.

404. INTRODUCTION TO LIGHT HORSE SCIENCE
A survey course covering the entire field of light horse science including breeds, feeding, genetics, stable management, diseases, and other aspects. Mr. O'Connor, staff. 3 lec/1 lab/4 cr.

501. ANIMAL ANATOMY AND PHYSIOLOGY
The general anatomy and physiology of domestic animals and birds. Mr. Allen. 3 lec/1 rec/4 cr.

502. FUNDAMENTALS OF ANIMAL HEALTH
The prevention, control, and treatment of bacterial and parasitic diseases in domestic animals. Prerequisite: AS 501 or permission of instructor. Staff. 3 lec/1 rec/4 cr.

503. ABATTOIR MANAGEMENT
Licensing requirements, sanitation, inspection facilities, and use of the slaughterhouse; field trips. Prerequisite: permission of instructor. Mr. G.L. Smith, Mr. Barney. 1 lec/1 lab/2 cr.

504. MEAT AND ITS PRODUCTS
Slaughtering, cutting, and identification of beef, lamb, pork, and poultry; field trips. Mr. G. L. Smith. 3 lec/1 lab/4 cr.

506 (506). PRINCIPLES OF NUTRITION
Fundamental principles underlying the nutrition of man and animals; the functions of the various nutrients in the maintenance, growth, and production of the animal body and the metabolic disorders resulting from their deficiency; the digestion, absorption, intermediary metabolism, and excretion of individual nutrients will be discussed within this framework. Mr. Repka and Mr. Schwab. (Also offered as Home Economics 506.) 3 lec/1 lab/4 cr.

507 (507). THE SCIENTIFIC APPROACH TO EQUINE DISCIPLINE
Physiological development, control, and education; bitting, longeing, and collection. Prerequisite: AS 402 or equivalent and permission of instructor. Ms. Briggs. 1 lec/1 lab/2 cr.

601-602. ANIMAL SELECTION
Principles of selection based on production performance, pedigree, and type evaluation. 601-1. Livestock, Mr. Barney; 602-2. Dairy, Mr. Fairchild. Elective only with permission of instructor; may be repeated. 1 lec/1 lab/2 cr.

603. APPLIED ANIMAL NUTRITION
Application of scientific principles of nutrition to feed formulation and feeding systems for poultry and livestock. Mr. G.L. Smith, staff. 3 lec/1 lab/4 cr.

605. EQUINE DISEASES AND PARASITES
Hygenic practices that help control many common bacterial, viral, and parasitic diseases in horses. Mr. O'Connor. 3 lec/1 lab/4 cr.

606. SMALL ANIMAL DISEASES
Common diseases in pets including dogs, cats, monkeys, rodents, birds, and aquarium fish. Mr. Stackhouse. 3 lec/1 lab/4 cr.

614. DISEASES AND PARASITES OF WILDLIFE
A survey of the diseases and parasites of fishes, birds, and game and fur-bearing animals. Control of diseases by management practices; effect of pesticides on wildlife; the relationship of wildlife diseases to human health; autopsy techniques, handling of specimens, and use of state lab facilities. Prerequisite: permission of instructor. Mr. Strout, staff. 3 lec/1 lab/4 cr.

616. EQUINE PODOLOGY
The structure and function of the appendicular skeleton, emphasis placed on the conformation of each segment of normal and abnormal limbs. Mr. O'Connor. 3 lec/1 lab/4 cr.

617-618. LIGHT HORSE CLINIC
Bandaging and restraint on actual clinical problems from the University herd. May be elected for two semesters. Mr. O'Connor. 1 lec/1 lab/2 cr.

651-652. MANAGEMENT OF DOMESTIC ANIMALS
The economic and management factors of the production of various species. Student may select any or all of specialized areas following: 651-1. Light Horses; 651-2. Dairy, Mr. Holter; 652-3. Livestock, Mr. G.L. Smith; 652-4. Poultry, Mr. Skoglund. Elective only with permission of instructor. 3 lec/1 lab/4 cr.

653-654. PRINCIPLES OF TEACHING EQUITATION
Teaching-techniques and procedures with emphasis on dressage; opportunity to teach riding theory and techniques to other students under supervision of instructor. Must be taken for two semesters. Prerequisite: AS 402, 507, 651-1, and permission of instructor. $80 fee. Ms. Briggs. 3 lec/1 lab/4 cr.

697 (697). ANIMAL SCIENCE SEMINAR
Survey: recent literature and research. Staff. 2 cr.

701. PHYSIOLOGY OF REPRODUCTION
Physiology, embryology, endrocrinology, reproduction, and lactation in domestic animals. Mr. Strout, Mr. Stackhouse. 3 lec/1 lab/4 cr.

702. EXPERIMENTAL ENDOCRINOLOGY OF REPRODUCTION AND LACTATION
The hormonal control of the estrous cycle; pregnancy and mammary gland growth and lactation; current experimental data. Prerequisite: Animal Science 701. 3 lec/1 lab/4 cr.

709. BIOCHEMISTRY OF NUTRITION
Intermediary metabolism of nutrients and energy; metabolism transport mechanisms; biological oxidations; interrelationships ofcarbohydrate, fat, and protein metabolism; obesity; control of hunger and appetite. Prerequisite: college course in biochemistry. (Also offered as Home Ec. 709.) Mr. Repka. 3 lec/1 lab/4 cr.

710. RUMINANT NUTRITION
Feeding and management of dairy animals; calf feeding, raising young stock, feeding for economical milk production. Mr. Holter. 3 lec/1 lab/4 cr.

711. COMPARATIVE ANIMAL GENETICS
How heredity affects domestic animals, poultry, other mammals, and fish; emphasis on the organism and population. Quantitative inheritance; principles of selection; disease resistance; statistical and experimental techniques. Prerequisite: 4 cr. of genetics or permission of instructor. Mr. Collins. 3 lec/1 lab/4 çr.

712. ANIMAL BREEDING AND IMPROVEMENT
Population genetics and selection with emphasis on the application of these principles to effect genetic improvement in dairy cattle, livestock, and horses. Prerequisite: AS 711. Mr. Fairchild. 3 lec/1 lab/4 cr. (Alternate years; offered 1977-78.)

713. INTRODUCTION TO ELECTRON MICROSCOPY
Principles and methods used in preparing and examining vertebrate, invertebrate, microbial, viral, plant, and physical specimens in the electron microscope. Theory and application of fixation and embedding procedures, ultramicrotomy, operation of the electron microscope, and special techniques such as autoradiography and ultrastructural histochemistry. Prerequisite: permission of instructor and general chemistry. Mr. Wight. 3 lec/1 lab/4 cr.

795-796. INVESTIGATIONS IN DAIRY, LIVESTOCK, POULTRY
Problems in: 1) Genetics, G. L. Smith, Collins, Fairchild; 2) Nutrition, G.L. Smith, Schwab, Holter, Repka; 3) Management, G.L. Smith, Skoglund, O'Connor; 4) Diseases, Allen, Corbett, Dunlop, O'Connor, Strout, S.C. Smith, Stackhouse, Wight; 5) Products, G.L. Smith; 6) Light Horsemanship, O'Connor, Briggs; 7) Physiology. Elective only with permission of instructor. May be repeated. Variable 1-4 cr.

Anthropology (ANTH)

(See Sociology and Anthropology)

The Arts (ARTS)

Chairperson: Arthur Balderacchi

PROFESSORS: George R. Thomas, emeritus; John W. Hatch, John Laurent, Melvin J. Zabarsky
ASSOCIATE PROFESSORS: Sigmund Abeles, Arthur Balderacchi, Richard D. Merritt, Winifred C. Shaw, Daniel L. Valenza
ASSISTANT PROFESSORS: Bruno Civitico, Margot Clark, Conley Harris, Brian T. Jefferson, Ian Walker, Shirley Zavin
VISITING ASSISTANT PROFESSOR: Lincoln Perry
ADJUNCT ASSISTANT PROFESSOR: Susan Faxon
INSTRUCTORS: Morton C. Abromson, Maryse Searls

Courses in the Department of The Arts are designed to support degree programs: B.A. and B.F.A.

Two-Dimensional Courses

(All courses elective by permission of the Department of The Arts)

(432) 432. DRAWING I
2 lab/4 cr.

(532) 532. DRAWING II
Prerequisite: Arts 432. 2 lab/4 cr.

533 (533). DRAWING III
Prerequisite: Arts 532. 2 lab/4 cr.

534. DRAWING IV
Prerequisite: Arts 533. 2 lab/4 cr.

The above courses are sequential drawing experiences, from the basic elements of line, form, space, etc. in various drawing media, concentrating on still-life and figure and leading to conceptual exercises with emphasis on the individual's drawing development.

455. ARCHITECTURAL DRAFTING AND DESIGN
Study of architectural symbols and interpretation of architectural plans. Problems in architectural design. 1 lec/2 lab/4 cr.

(536) 536. INTRODUCTORY PRINTMAKING
Graphic arts in a range of media. Prerequisite: Arts 532. 2 lab/4 cr.

542. OIL PAINTING I
Prerequisite: Arts 432. 2 lab/4 cr.

547, 548. OIL PAINTING II
Prerequisite: Arts 542. 2 lab/4 cr.

643, 644. OIL PAINTING III
Prerequisite: Arts 547, 548. 2 lab/4 cr.

The above courses are sequential painting experiences. Aspects of composition, color, and conceptualization.

544. WATER MEDIA I
Transparent and opaque water color. Prerequisite: Arts 542. 2 labs/4 cr.

545. WATER MEDIA II
Introduction to other media. Prerequisite: Arts 544. 2 labs/4 cr.

551 (551). PHOTOGRAPHY I
Theory and practice of black and white creative photography. Prerequisite: Arts 432. 1 lec/1 lab/4 cr.

636, 637. PRINTMAKING WORKSHOP
Prerequisite: Arts 536. 2 lab/4 cr.

651. PHOTOGRAPHY II
Theory and practice of creative color photography. Camera and laboratory manipulative methods in black and white and/or color. Prerequisite: Arts 551. 1 lab/4 cr.

751. PHOTOGRAPHY III
Application of new materials and methods. Prerequisite: Arts 651. 1 lab/4 cr.

(796) 796. INDEPENDENT STUDY IN THE VISUAL ARTS
1) Photography; 2) Sculpture; 3) Drawing; 4) Painting; 5) Graphics; 6) Water Media; 7) Drafting and Architectural Design; 8) Art Education; 9) Curatorial Assistant; 10) Art History; 11) Ceramics; 12) Jewelry and Metalsmithing; 13) Weaving; 14) Wood Design. Prerequisite: permission of departmental chairperson. Hours to be arranged. Credits to be arranged. May be repeated to a total of 8 credits. Variable cr.

798. SEMINAR/SENIOR THESIS
Readings and discussions oriented toward the intellectual premises of art. Culminates in mounting an exhibition of the student's work. Required of all students in the BFA program. Other advanced students may elect with instructor's permission. 1 lab/8 cr.

Three-Dimentsional Courses

(All courses elective by permission of the Department of The Arts)

501 (501). CERAMICS I
Principles and materials of ceramics. Prerequisite: Arts 432. 2 lab/4 cr.

513 (513). JEWELRY AND METALSMITHING I
Principles and materials of jewelry and metalsmithing. Prerequisite: Arts 432. 2 lab/4 cr.

519 (519). WEAVING I
Principles and materials of weaving. Prerequisite: Arts 432. 2 lab/4 cr. (A section of this course is offered for 2 credits for Occupational Therapy majors only. No prerequisite.)

525 (525). WOODWORKING
Principles and materials of woodworking. Prerequisite: Arts 432. 2 lab/4 cr. (A section of this course is offered for Occupational Therapy majors only. No prerequisite.)

567 (567). SCULPTURE I
Principles and materials of sculpture. Prerequisite: Arts 432. 2 lab/4 cr.

598. SPECIAL PROBLEMS IN THE VISUAL ARTS
Special problems in the visual arts. Topic and prerequisites to be announced prior to preregistration. Prerequisite: permission of instructor. 3 lec or 2 lab/4 cr.

601, 602. CERAMICS II AND III
Studio research into technical and aesthetic solutions of contemporary problems. Prerequisite: Arts 501. 2 lab/4 cr.

613, 614. JEWELRY AND METALSMITHING II AND III
Design and construction of small-scale objects. Prerequisite: Arts 513. 2 lab/4 cr.

619. WEAVING II
Four and Eight harness weaves; double weave and 3-D fiber constructions. Prerequisite: Arts 519. 2 lab/4 cr.

625, 626. WOOD/FURNITURE DESIGN
Studio design and construction of major furniture forms. Prerequisite: Arts 525. 2 lab/4 cr.

668, 669. SCULPTURE II AND III
Studio research into technical and aesthetic solutions of contemporary problems. Prerequisite: Arts 567. 2 lab/4 cr.

701. CLAY AND GLAZE FORMULATION
Prerequisite: Arts 601 and 602. 2 lab/4 cr.

725. WOOD/ENVIRONMENTAL DESIGN
Design and construction of human surroundings. Portfolio required. Topic announced prior to preregistration. Prerequisite: two 600-level studio courses in the 3-D discipline. 2 lab/4 cr.

767. CASTING
Study with cast bronze and aluminum sculpture. Prerequisites: two 600-level studio courses in the 3-D dsicipline. 2 lab/4 cr.

768. SCULPTURE IV
Advanced studio research. Individual criticism. Prerequisite: Arts 668, 669, 767. Arranged. 4 cr.

See also Arts 796 and 798.

History of Art Courses

(Exemption from prerequisities by permission of instructor.)

431 (431). VISUAL STUDIES
Appreciation and understanding of the visual arts. Works from a variety of periods; emphasis on style, formal analysis, methods and materials of production. 2 lec/1 2-hr. related studio experience/4 cr.

475 (475). HISTORY OF WESTERN ART I
Major monuments from the Prehistoric through the Gothic period. 4 cr.

(476) 476. HISTORY OF WESTERN ART II
Painting, sculpture, and architecture from the Renaissance to the present. Arts 475 is not a prerequisite. 4 cr.

575 (575). GREEK AND ROMAN ART
Painting, sculpture, and architecture of ancient Greece and Rome from approximately 1500 B.C. to 315 A.D. Prerequisite: Arts 475. 4 cr.

577. EARLY MEDIEVAL ART
The development of Christian art to include Early Christian art, Byzantine art in the East and West, Coptic art, and Christian art in northern Europe to the 11th century. Architecture, painting, sculpture, and the minor arts. Prerequisite: Arts 475. 4 cr.

578. ROMANESQUE AND GOTHIC ART
Art in western Europe from the 11th to the 15th century. Painting and the minor arts; major emphasis on architecture and sculpture. Prerequisite: Arts 475. 4 cr.

(580) 580. NORTHERN RENAISSANCE ART
Painting, sculpture, and graphic arts in France, Germany, Austria, and the Lowlands from the 14th through the 16th century. Prerequisite: Arts 476. 4 cr.

582. ITALIAN RENAISSANCE ART I
Painting, sculpture, and architecture of the Trencento and Quatrocento; Giotto, Masaccio, Piero della Francesca, Alberti, Brunelleschi, Ghiberti, Donatello, Mantegna, and Bellini. Prerequisite: Arts 476. 4 cr.

583. ITALIAN RENAISSANCE ART II
A continuation of Arts 582. Emphasis on the major figures of the High Renaissance: Bramante, Leonardo, Raphael, Michaelangelo, and Titian. Prerequisite: Arts 476. 4 cr.

585. BAROQUE ART IN SOUTHERN EUROPE
Painting, sculpture, and architecture in Italy in the 17th and 18th centuries; 17th century painting in Spain. Prerequisite: Arts 476. 4 cr.

586. BAROQUE ART IN NORTHERN EUROPE
Painting, sculpture, and architecture in France in the 17th and 18th century; 17th century painting in the Lowlands; English and Bavarian architecture. Prerequisite: Arts 476. 4 cr.

588. 19th CENTURY ART
Principal developments in painting, sculpture, and architecture from David through Cezanne. Prerequisite: Arts 476. 4 cr.

589. 20th CENTURY ART
Principal developments in painting, sculpture, and architecture from the 1890's through the 1960's. Prerequisite: Arts 476. 4 cr.

591 (591). MODERN ARCHITECTURE
Major trends in European and American architecture and city planning since the mid-19th century; directions in contemporary architecture. Visits to contemporary buildings and with architects in the area. Prerequisites: Arts 475 or 476. 4 cr.

593 (593). AMERICAN ART
A chronological survey of painting and sculpture in the United States from the Colonial period to the present. Prerequisite: Arts 476. 4 cr.

(594) 594. AMERICAN ARCHITECTURE
From earliest Colonial times to the present; field trips in New Hampshire, Massachusetts, and Maine. Prerequisite: Arts 475 or 476. 4 cr.

597. INTRODUCTION TO NON-WESTERN ART
Origins of art in pre-history. Evolution of pictorial and sculptural images in primitive cultures and the Orient; concentration on the development of pictorial art in China and Japan. 4 cr. (Alternate years.)

599. MUSEUM STUDIES
Introduction to museum practices. History of museums: their purposes, organization, interpretation, policies, and procedures. Use of University Art Galleries, visits to other museums, lecturers. Prerequisite: two courses in Art History and permission of instructor. 4 cr.

675. SEMINAR IN MEDIEVAL ART
Topics will vary; announced prior to registration. Prerequisite: permission of instructor. 4 cr.

676. SEMINAR IN RENAISSANCE AND BAROQUE ART
Topics will vary; announced prior to registration. Prerequisite: permission of instructor. 4 cr.

677. SEMINAR IN MODERN ART
Topics will vary; announced prior to registration. Prerequisite: permission of instructor. 4 cr.

678. SEMINAR IN AMERICAN ARCHITECTURE
Topics in the history and practice of architecture in America from early Colonial times to present; announced prior to registration. Prerequisite; permission of instructor. 4 cr.

See Arts 796.

Art Education Courses

(All courses elective by permission of the Department of The Arts)

493 (493). INTRODUCTION TO ART EDUCATION
Contemporary programs in art, school practices, materials and methods of teaching. 4 cr.

791-792. VISUAL EDUCATION
Philosophy, purpose, and objectives of art teaching in schools, grades K-12. Curriculum development, in-school experiences. 1 lec2 lab4 cr.

See also Arts 796.

Biochemistry (BCHM)

Chairperson: Gerald L. Klippenstein

PROFESSORS: Stanley R. Shimer, emeritus; Donald M. Green, Edward J. Herbst, Miyoshi Ikawa, Samuel C. Smith, Arthur E. Teeri
ASSOCIATE PROFESSORS: Gerald L. Klippenstein, James A. Stewart

402. BIOCHEMISTRY AND MAN
Of interest to all students; examines the biochemical prinicples man uses to modify his environment and existence, and the biochemical basis of disease treatment and prevention, nutrition, industrial processing, food manufacturing, and pollution and its control. Mr. Green. Prerequisite: secondary school level general chemistry. 3 lec/4 cr.

501. BIOLOGICAL CHEMISTRY
Includes an introduction to organic chemistry. Prerequisite: one semester of chemistry or equivalent. Students receiving credit for Biochem. 501 may not receive credit for Biochem. 601. Mr. Teeri. 3 lec/1 lab/4 cr.

601. GENERAL BIOCHEMISTRY
The general principles. Prerequisite: organic chemistry. Students receiving credit for Biochem. 601 may not receive credit for Biochem. 501. Mr. Ikawa. 3 lec/1 lab/4 cr.

656. PHYSIOLOGICAL CHEMISTRY AND NUTRITION
Mammalian biochemistry with emphasis on the human. Lab study includes procedures basic to chemical methods of medical diagnosis. Prerequisite: organic chemistry. Mr. Teeri. 3 lec/1 lab/4 cr.

699 (699). SENIOR THESIS
Research in biochemistry for senior majors who have completed a course in biochemistry. 2 cr.

702. COMPARATIVE MARINE BIOCHEMISTRY
Nutrition, metabolism, and composition of marine organisms; pigments, toxins, hormones, and luminescence. Mr. Ikawa. Prerequisite: Biochem. 601 or equivalent. 3 lec/3 cr. (Alternate years; offered in 1977-78).

721. NEUROCHEMISTRY
The biochemistry of the nervous system; metabolism and alterations of normal brain chemistry by drugs, chemicals, nutrition, memory, and learning; pathological changes. Mr. Stewart. Prerequisite: a biochemistry course. 3 cr. (Alternate years; offered in 1976-77.)

751-752. PRINCIPLES OF BIOCHEMISTRY
Fundamental biochemistry; chemistry, metabolism, and biological function of nucleic acids, proteins, carbohydrates, and lipids. Prerequisite: organic chemistry or permission of instructor. Mr. Klippenstein and Mr. Stewart. 3 lec/1 lab/4 cr.

760. ENZYME CHEMISTRY
Structure, properties, and function of enzymes; kinetics and mechanisms of enzyme-catalyzed reactions; purification, characterization, and assay of enzymes. Mr. Klippenstein. Prerequisite: Biochem. 601 or 751. 3 lec/1 lab/4 cr. (Alternate years; offered in 1976-77.)

770. BIOCHEMICAL GENETICS
The mechanisms of storage, replication, transmission, transcription, recombination, mutation, and expression of genetic information by cells and viruses. Mr. Green. Prerequisite: Biochem. 751 or permission of instructor. 3 lec/1 lab/4 cr. (Alternate years; offered in 1977-78.)

781. THE NUCLEIC ACIDS
Chemistry and metabolism of nucleic acids; molecular structures, purification and separation, biosynthesis, and biological functions. Mr. Herbst. Prerequisite: organic chemistry and biochemistry. 3 lec/3 cr.

795, 796. INVESTIGATIONS IN BIOCHEMISTRY
Prerequisite: permission of instructor. Subject matter and hours to be arranged. 2 cr.

Biology (BIOL)

See additional course descriptions under Animal Sciences, Biochemistry, Botany, Entomology, Forest Resources, Microbiology, Plant Sciences, and Zoology

401. HUMAN BIOLOGY
Elementary study of structure, function and development of all systems of the body. No credit toward major or minor. Cannot be taken for credit after Zoo. 507-508. 4 cr.

(402) 402. MAN AND HIS ENVIRONMENT
Basic interrelationships between organisms and populations and their environments; ecosystems; man's modification of his environment and its consequences. No credit toward a major or minor. Students with credit for Bio. 541 or 641 cannot receive credit for Bio. 402. 4 cr.l

(403). THE LIVING WORLD
General survey of plant and animal kingdoms; elementary principles of heredity, evolution, and ecology. No credit toward a major or minor. 4 cr.

404. HEREDITY AND MAN
Genetic basis for variation in human inheritance; normal and abnormal chromosome complements, genetic diseases, and genetic material in evolution. No credit toward a major or minor. Students with credit for Zoo. 604 cannot receive credit for Bio. 404. 4 cr.

(407). CONCEPTS IN CELL BIOLOGY
An experimental and historical approach; emphasis on cell structures which play an important role in the development of the adult organism from the egg. The philosophy and practical limitations of research in biology will be considered. No credit toward a major or minor. 4 cr. (Alternate years; offered 1977-78.)

409 (409). HUMAN REPRODUCTIVE BIOLOGY
Aspects of human sexuality from anatomical, physiological, and other viewpoints. No credit toward a major or minor. 4 cr.

420. MAN, NATURE, AND DISEASE
Ecology of human disease; role of disease in history; biological, social, and economic problems involved in eradication and control. Particular attention to diseases that still account for serious sickness and mortality in overpopulated, underdeveloped countries. No credit toward a major or minor. 4 cr.

541 (541). GENERAL ECOLOGY
Interrelationships between organisms and their physical environment; populations, communities, the ecosystem, energy flow. Prerequisite: introductory chemistry, Botany 411, Zoology 412, or equivalent. 4 cr.

543 (543). FIELD ECOLOGY
Consideration of ecological principles by inquiry in natural habitats and in the laboratory. Prerequistite: Math 425 or statistics or equivalent, present or prior enrollment in Bio. 541, and permission of instructor. 1 lab2 cr.

791. PROBLEMS IN THE TEACHING OF HIGH SCHOOL BIOLOGY
Objectives and methods; selection and organization of materials, preparation of visual aids, and other projects; use of field trips. Prerequisite: two years of biological science and permission of instructor. 4 cr.

Botany and Plant Pathology (BOT)

Chairperson: Robert D. Blanchard

PROFESSORS: Stuart Dunn, emeritus; Albion Hodgdon, emeritus; Charlotte G. Nast, emerita; Arthur Mathieson, Avery Rich, Richard Schreiber
ADJUNCT PROFESSOR: Alex L. Shigo
ASSOCIATE PROFESSOR: A. Linn Bogle
ASSISTANT PROFESSORS: Marion E. Mills, emerita; Alan L. Baker, Garrett Crow, May Haugstad, Robert Blanchard, Russell Kinerson, William MacHardy, Subhash Minocha

411. GENERAL BOTANY
Introduction to plant biology. Evolution of structure and function in the plant kingdom. Equivalent to Bot. 412. Cannot be taken for credit if credit received for Bot. 412. Mr. Schreiber. 3 lec/1 lab/4 cr.

412. INTRODUCTORY BOTANY
All groups of plants; growth, development, and environmental responses. Equivalent to Bot. 411. Cannot be taken for credit if credit received for Bot. 411. Ms. Haugstad. 3 lec/1 lab/4 cr.

503. THE PLANT WORLD
Survey of the plant kingdom from an evolutionary point of view; from the bacteria to the flowering plants, tracing the evolution of form, structure, and function in, and the interrelationship of, the major plant groups. Prerequisite: Bot. 411 or 412, or equivalent with permission of instructor. Mr. Bogle. 2 lec/2 lab/4 cr.

525. INTRODUCTION TO MARINE BOTANY
Life history, classification, and ecology of micro- and macroscopic marine plants, including phytoplankton, seaweed, and salt marsh plants, and the interactions between man and marine plant communities. Occasional Saturday morning field trips. Prerequisite: Bot 411 or 412, a semester of biology, or permission of instructor. Staff. 3 lec/1 lab/4 cr. (Summer session only, 1976-77.)

566. SYSTEMATIC BOTANY
Scientific basis of plant taxonomy and identification and classification of native trees, shrubs, and wild flowers. Prerequisite: one semester of biological science. Mr. Crow. 2 lec/2 lab/4 cr.

(606) 606. PLANT PHYSIOLOGY
Function of higher plants: water relations, metabolism, growth, and development. Prerequisite: Bot. 411, 412, 503, or Plant Science 421 and one year of chemistry or permission of instuctor. Mr. Minocha, Mr. Pollard. 3 lec/1 lab/4 cr.

717. GENERAL LIMNOLOGY
Special relationships of freshwater organisms to the chemical, physical, and biological aspects of their environment; factors regulating their distribution; and the primary and secondary productivity of lakes. Prerequisite: Biol. 541 or equivalent. Individual projects. Mr. Baker, Mr. Haney. 3 lec/4 cr.

719. FIELD LIMNOLOGY
Principles of freshwater ecology, from a variety of habitats; the methods used to study lakes and interpretations of data. Occasional Saturday field trips. Prerequisite: prior or simultaneous enrollment in Bot. 717 and permission of instructor. Mr. Baker and Mr. Haney. 2 lab/3 cr.

721. THE MICROSCOPIC ALGAE
Survey of phytoplankton and periphyton in local marine and freshwater habitats. Identification, systematics, and evolution. Class and individual collection trips. Prerequisites: Bot. 411, 412, or 503. Mr. Baker. 2 lec/2 lab/4 cr.

722. MARINE PHYCOLOGY
The identification, classification, ecology, and life histories of the major groups of marine algae, particularly the benthonic marine algae of New England. Periodic field trips. Prerequisite: Bot. 411, 412, or 502. Mr. Mathieson. 2 lec/2 lab/4 cr. (Alternate years; offered in 1977-78.)

723. MARINE ALGAL ECOLOGY
Distribution, abundance, and growth of marine plants in relation to their environment. Scheduled field trips and an independent research project are required. Prerequisite: Bot. 722, Zoo. 715, or permission of instructor. Mr. Mathieson. 2 lec/1 lab/4 cr. (Alternate years; offered in 1976-77.)

724. FRESHWATER ALGAL ECOLOGY
Survey of freshwater algal habitats; man's impact on algal communities of lakes and streams. Winter and spring field problems. Prerequisite: Bot. 721 or permission of instructor. Mr. Baker. 2 lec/2 lab/4 cr.

730. MORPHOGENESIS
Principles of differentiation; internal and external factors in cellular and organismic development. Prerequisite: Bot. 605 or permission of instructor. Mr. Minocha. 3 lec/1 lab/4 cr.

732. CELL BIOLOGY
Structure, behavior, and development of cells; the cellular basis of heredity. Prerequisite: one year of biological science and chemistry. Mr. Schreiber. 3 lec/1 sem/4 cr.

735. CELL PHYSIOLOGY (PLANT)
Function of living cells, emphasis on algal cells. Prerequisite: one year of general chemistry and biological science. Mr. Minocha. 2 lec/2 lab/4 cr.

741. ECOSYSTEM ANALYSIS
Ecosystem structure and function; energy flow and biochemical cycles. Computer simulations of natural ecosystems. Prerequisite: Biol. 541 or permission of instructor. Mr. Kinerson. 1 lec/1 lab/1 colloq/4 cr.

742. PHYSIOLOGICAL ECOLOGY
Physiological responses of plants to the physical environment; photosynthesis, water relations, mass and energy flow. Prerequisite: Bot. 606 or permission of instructor. Mr. Kinerson. 1 lec/1 lab/1 colloquim/4 cr.

747. AQUATIC HIGHER PLANTS
Flowering plants, fern relatives, and Bryophytes found in and about bodies of water in the northeastern United States; extensive field and herbarium work, preparation techniques, and collections. Prerequisite: Bot. 566. Mr. Crow. 2 lec/2 lab/4 cr.(Alternate years; offered in 1976-77.)

751. PLANT PATHOLOGY
Nature, symptomatology, etiology, classification, and control of important plant diseases. Prerequisite: Bot. 411 or 412, or equivalent. Mr. Rich. 2 lec/2 lab/4 cr.

752. MYCOLOGY
Parasitic and saprophytic fungi; growth, reproduction, and identification; preparation of pure cultures. Prerequisite: Bot. 411 or 412, or equivalent. Mr. Blanchard. 2 lec/2 lab/4 cr. (Alternate years; offered in 1977-78.)

753. FOREST PATHOLOGY
Principles, etiology, epidemiology, and control of forest and shade tree diseases. Prerequisite: Bot. 411 or 412, or equivalent. Mr. Blanchard. 2 lec/2 lab/4 cr.

(754). PRINCIPLES OF PLANT DISEASE CONTROL
Exclusion, eradication, protection, immunization, and the specific practical methods used to control plant diseases. Prerequisite: Bot. 751 or 753. Mr. MacHardy. 2 lec/2 lab/4 cr. (Alternate years; offered in 1977-78.)

758. PLANT ANATOMY
Anatomy of vascular plants, emphasizing structure and development of basic cell and tissue types, and of the major plant organs. Prerequisite: Bot. 411 or 412, or 503. Mr. Bogle. 2 lec/2 lab/4 cr. (Alternate years; offered in 1976-77.)

762. MORPHOLOGY OF THE VASCULAR PLANTS
Comparative form and structure of the major living and extinct groups; evolutionary modifications of the vegetative and reproductive organs, and the basic life history pattern. Prerequisite: Bot. 411, 412, or 503. Mr. Bogle. 2 lec/2 lab/4 cr. (Alternate years; offered in 1977-78.)

764. MICROTECHNIQUE
Methods of preserving cell and tissue structure, embedding, sectioning, and staining plant tissues, and an introduction to microscopy. Prerequisite: permission of instructor. Mr. Bogle. 2 lec/2 lab/4 cr. (Alternate years; offered in 1976-77.)

767. ADVANCED SYSTEMATIC BOTANY
Principles and rules of plant classification and nomenclature; plant families; field and herbarium work. Prerequisite: Bot. 566. Mr. Crow. 1 lec/1 colloq/1 lab/4 cr. (Alternate years; offered in 1977-78.)

795-796. INVESTIGATIONS IN:
1) Systematic Botany; 2) Plant Physiology; 3) Plant Pathology; 4) Plant Anatomy; 5) Plant Ecology; 6) Mycology; 7) Cell Biology; 8) Phycology; 9) Botanical Teaching; 10) Morphology; 11) Cell Physiology; 12) Scientific Writing. Individual projects under faculty guidance. Elective only with permission of instructor. Hours to be arr. 2-4 cr.

Chemical Engineering (CH E)

Chairperson: Stephen S.T. Fan

PROFESSORS: Irvin Lavine, emeritus; Oswald T. Zimmerman, emeritus
ASSOCIATE PROFESSOR: Stephen S.T. Fan
ASSISTANT PROFESSORS: Virendra K. Mathur, Gail D. Ulrich, Charles E. Wyman

410. SURVEY OF CURRENT ENERGY AND POLLUTION ISSUES
Energy supply in this country and the world; conventional fuel reserves: coal, oil, natural gas; alternative sources: nuclear, solar, geothermal etc. Forecasts and strategies to meet needs. Environmental pollution, sources, and economic and environmental impacts. Methods for pollution control. Regulatory standards for environmental protection. Prerequisite: good background in high school chemistry. 3 lec/1 rec/4 cr.

501. INTRODUCTION TO CHEMICAL ENGINEERING I
Overview of the profession. Systems of units; material balances and chemical reactions; gas laws; phase phenomena. 2 cr.

502. INTRODUCTION TO CHEMICAL ENGINEERING II
Energy and material balances for simple and complex systems with and without chemical reactions. 4 cr.

601. FLUID MECHANICS AND UNIT OPERATIONS
Continuity, momentum, and energy equations; laminar and turbulent flow in pipes; rheology. Applications to flow in porous media, filtration, and fluidization. 3 lec/1 lab/4 cr.

602. HEAT TRANSFER AND UNIT OPERATIONS
Thermal properties of materials, steady-state and transient conduction and convection; radiation; applications to heat exchangers and process equipment. 3 lec/1 lab/4 cr.

603. APPLIED MATHEMATICS FOR CHEMICAL ENGINEERS
Mathematical modeling and analysis of chemical engineering problems. Analytical methods for first- and second-order differential equations; numerical solutions; Series solutions; Bessel function; Laplace transforms; matrix algebra. Interpretation and solution of partial differential equation. 3 lec/1 lab/4 cr.

604. CHEMICAL ENGINEERING THERMODYNAMICS
Volumetric and phase behavior of ideal and real gases and liquids; cycles; steady-flow processes; chemical equilibrium. 3 lec/1 lab/4 cr.

605. MASS TRANSFER AND STAGEWISE OPERATIONS
Diffusion in gases, liquids, and solids; design and analysis of distillation, absorption, adsorption, extraction and other stagewise equipment and operations. 3lec/1 lab/4 cr.

606. CHEMICAL ENGINEERING KINETICS
Use of laboratory data to design commercial reactors. Continuous, batch, plug-flow, and stirred-tank reactors for homogeneous and catalytic multiphase reactions. 3 lec/1 lab/4 cr.

608. CHEMICAL ENGINEERING DESIGN
Introduction to cost engineering. Application of acquired skills to design of chemical processes. Individual, major design project required. 3 lec/1 lab/4 cr.

609. FUNDAMENTALS OF AIR POLLUTION AND ITS CONTROL
Sources, pollutant transfer, and effects. Regulatory, administrative, legal, and social aspects; engineering control. 4 cr.

695. CHEMICAL ENGINEERING PROJECT
Independent research problems carried out under faculty supervision. Variable 2-4 cr.

696. INDEPENDENT STUDY
Prerequisite: permission of the adviser and department chairperson; granted only to students having superior scholastic achievement. Variable. 1-4 cr.

701. HIGH POLYMERS
Principles and practice of industrial methods of polymerization and processing. Physical and chemical testing of various polymers. 3 lec/1 lab/4 cr.

705. NATURAL AND SYNTHETIC FOSSIL FUELS
Study of U.S. and foreign reserves of coal, oil, and natural gas. Petroleum processing and refining. Coal, oil shale, and tar sand. Gasification and liquefaction of coal. 3 lec/1 lab/4 cr.

712. INTRODUCTION TO NUCLEAR ENGINEERING
Development of nuclear reactors; basic binding-energy physics; radioactivity; elements of nuclear reactor theory; engineering problems of heat transfer, fluid flow, materials selection, and shielding; environmental impacts. 4 cr.

750. INTRODUCTION TO PROCESS SIMULATION AND OPTIMIZATION
Analysis and numerical simulation of controlled chemical systems. Laplace transforms. Transient responses. Solution of nonlinear equations. Simultaneous, ordinary differential equations; Runge-Kutta, Crank-Nicholson methods. Steady state optimization: linear programming, classical search techniques. Unsteady state optimization: Pontryagin's maximum principle. 3 lec/1 rec/4 cr.

772. PHYSICOCHEMICAL PROCESSES FOR WATER AND AIR QUALITY CONTROL
Origin and characterization of pollutants. Controls, including filtration, sedimentation, coagulation and flocculation, absorption and adsorption. Applied fluid mechanics, mass transfer, and kinetics. Thermal pollution, chemical treatment, oil spills on water, and aeration. 3 lec/1 lab/4 cr.

Chemistry (CHEM)

Chairperson: Alexander R. Amell

PROFESSORS: Harold A. Iddles, emeritus; Alexander R. Amell, Kenneth K. Andersen, Albert F. Daggett, Clarence L. Grant, Helmut M. Haendler, Paul R. Jones, Gloria G. Lyle, Robert E. Lyle, James D. Morrison, Frank L. Pilar, Albert K. Sawyer, J. John Uebel, Charles M. Wheeler
ASSOCIATE PROFESSORS: N. Dennis Chasteen, David W. Ellis, Colin D. Hubbard, Charles W. Owens, James H. Weber

***401-402. GENERAL CHEMISTRY**
Elementary, nonmathematical, broad view of chemistry including laboratory work. For students who intent to take no additional chemistry course, students whose major department requires this course, and those interested in satisfying a science requirement. Cannot be used as a prerequisite for other chemistry courses without permission of the chemistry department. 3 lec/1 lab/4 cr.

***403-404. GENERAL CHEMISTRY**
Fundamental laws and concepts; non-metals and metals and their compounds. Theoretical principles are illustrated by lecture demonstrations; the applications of chemistry in the professions are explained. For students who plan to take further chemistry courses. 3 lec/1 lab/4 cr.

***405. INTRODUCTORY CHEMISTRY**
Discussion of the basic principles; atomic structure, bonding, equilibria, and thermodynamics. First course for chemistry majors. Presupposes secondary-school chemistry. Cannot be taken for credit if credit received for Chem. 403-404. 3 lec/1 lab/4 cr.

*Students may receive credit for only one course from 401, 403, 405, and 409 and for only one course from 402, 404, 410.

406. QUANTITATIVE ANALYSIS
Studies of pollution, environmental problems, and the more traditional professional work in chemistry rely heavily on a sound knowledge of analytical chemistry. Principles and techniques of chemical analysis, normally followed by a more advanced course in instrumental methods of chemical analysis. (Students must register for 407 concurrently.) Prerequisite: Chem. 404 or 405. 3 lec/3 cr.

407. QUANTITATIVE ANALYSIS LABORATORY
Techniques of weighing and titration and of gravimetric and volumetric analysis; instrumental methods of analysis. Treatment of data, error analysis, and calculations of results. (Must be taken concurrently with 406.) 1 lab/2 cr.

409-410. BACKGROUND OF CHEMICAL IDEAS
Present-day chemical theories in their historical and philosophical context; their relationships to other fields of human thought. Class discussion and concentrated study of topics of interest to students. Cannot be used as prerequisite for other Chemistry courses. 3 lec/4 cr.

517. QUANTITATIVE ANALYSIS
For students planning careers in medicine, dentistry, plant and animal science, nursing, oceanography, and environmental science. Gravimetric, volumetric, and instrumental methods. Prerequisite: Chem. 404 or 405. (Students must take 518 concurrently.) 3 lec/3 cr.

518. QUANTITATIVE ANALYSIS LABORATORY
Gravimetric and volumetric determination; separations; and selected instrumental methods such as pH and potentiometry, spectrophotometry, atomic absorption, and gas chromatography. (Students must register for 517 concurrently.) 1 lab/2 cr.

545. ORGANIC CHEMISTRY
Introductory study of carbon compounds for those who desire a brief terminal course. Prerequisite: Chem. 404 or 405. Elective for medical technology, nursing, and majors in botany. (546 must be taken concurrently.) Students receiving credit for Chem. 545 may not receive credit for Chem 402, 547-548, or 651-652. 3 lec/3 cr.

546. ORGANIC CHEMISTRY LABORATORY
(Must be taken concurrently with 545.) 1 lab/2 cr.

547-548. ORGANIC CHEMISTRY
Principal classes of organic compounds, aliphatic and aromatic, class reactions and structural theory. Intended primarily for chemistry and biochemistry majors. Prerequisite: Chem. 404 or 405 or permission of instructor. (549-550 must be taken concurrently.) Students receiving credit for Chem. 547-548 may not receive credit for either Chem. 545 or 651-652. 3 lec/3 cr.

549-550. ORGANIC CHEMISTRY LABORATORY
(Must be taken concurrently with 547-548.) 1 lab/2 cr.

651-652. ORGANIC CHEMISTRY
Principal classes of organic compounds, aliphatic and aromatic, class reactions and structural theory. Laboratory: preparation and purification of selected organic coumpounds. Intended primarily for prehealing-arts, biological science, and health science students. Prerequisite: Chem. 404 or 405 or permission of instructor. (653-654 must be taken concurrently.) Students receiving credit for Chem. 651-652 may not receive credit for either Chem. 545 or 547-548. 3 lec/3 cr.

653-654. ORGANIC CHEMISTRY LABORATORY
(Must be taken concurrently with 651-652.) 1 lab/2 cr.

663. INTRODUCTORY RADIOCHEMICAL TECHNIQUES
Techniques and laboratory practice in the use of apparatus in many fields of science using radiochemical operations. Prerequisite: general inorganic chemistry and general physics. 3 lec/1 lab/4 cr.

683-684. PHYSICAL CHEMISTRY I, II
The properties of gases, liquids, and solids; thermochemistry and thermodynamics; solutions, chemical equilibria, reaction rates, conductance, and electromotive force. Prerequisite: Math 426 and physics. Undergraduates must register for 685-686 concurrently. 3 lec/3 cr.

685-686. PHYSICAL CHEMISTRY LABORATORY
Measurement of thermodynamic properties, chemical kinetics, and methods of determining the structure of matter. Prerequisite: Math 426 and physics. 683-684 must be taken concurrently. 1 lab/2 cr.

696. INDEPENDENT STUDY
For exceptional students. Individual reading, writing, or laboratory work carried out under the tutelage of a faculty member. The course may be used to replace specific required courses in chemistry. Prerequisite: approval of the adviser and department chairperson. Credits to be arranged.

697. CHEMICAL LITERATURE
The chemistry library as a research tool Prerequisite: Chem. 548 or 652. 1 cr.

698. SEMINAR
Student reports on topics of interest. Prerequisite: Chem. 548 or 652, and 684. 1 cr.

699. THESIS
Year-long investigation in a selected topic with background and experimental investigation. For seniors in chemistry who have completed Chem. 548, 762, 684 and have a grade point average of 2.5, or permission of adviser and department chairperson. 5 lab/4 cr. Cr/F.

708. RESEARCH TECHNIQUES
Lectures and laboratory to show experimental methods and interpretation of results. Topics include chromatography, data handling, nuclear magnetic resonance, mass spectrometry, elementary electronics, infrared and ultraviolet spectroscopy, and X-ray. 1-3 cr.

755. ADVANCED ORGANIC CHEMISTRY
Methods of synthesis and determination of structure, including stereochemistry, of complex organic compounds. Laboratory: synthesis and structural determination of complex organic compounds, techniques for the separation, determination of purity, and identification of compounds by spectroscopic and chemical means. Prerequisite: Chem. 547 or 651 or equivalent. (Students must register for 756 concurrently.) 3 cr.

756. ADVANCED ORGANIC CHEMISTRY LABORATORY
(Must be taken concurrently with 755.) 1 lab/2 cr.

762. INSTRUMENTAL METHODS OF CHEMICAL ANALYSIS
Theory, instrumentation, and application of methods such as atomic absorption, conductimetry, coulometry, emission spectrography, gas chromatography, polarography, potentiometry, and spectrophotometry to chemical analysis. Prerequisite: Chem. 406; Chem. 684 as a prerequisite or concurrently or permission of instructor. (Students must register for 763 concurrently.) 3 lec/3 cr.

763. INSTRUMENTAL METHODS OF CHEMICAL ANALYSIS LABORATORY
Experimental parameters, error analysis, and applications of the methods covered in Chem. 762. (Must be taken concurrently with 762.) 1 lab/2 cr.

774. INORGANIC CHEMISTRY
Basic theoretical concepts and their applications to inorganic reactions and compounds. Prerequisite: Chem. 683; Chem. 684 pre- or corequisite: or permission of instructor. Undergraduates must take 775 concurrently. 3 cr.

775. INORGANIC CHEMISTRY LABORATORY
Synthesis and characterization of inorganic compounds with an emphasis on techniques not taught in other laboratory courses. (Undergraduates must take 774 concurrently.) 1 lab/2 cr.

776. PHYSICAL CHEMISTRY III
Quantum theory; spectroscopy; chemical bonding; statistical thermodynamics. Prerequisite: Chem. 683. 4 cr.

778. CHEMISTRY OF LARGE MOLECULES
Basic chemistry of high-molecular-weight compounds, including synthetic polymers and substances occurring in living systems. Elementary aspects of the structures, syntheses and properties of large molecules, and their roles in modern science, technology, and living systems. Prerequisite: one semester of organic chemistry. 4 cr.

Civil Engineering (CI E)

Chairperson: Robert P. Vreeland

PROFESSORS: Russell R. Skelton, emeritus; Charles O. Dawson, J. Harold Zoller
ASSOCIATE PROFESSORS: Paul L. Bishop, Louis H. Klotz, Paul J. Ossenbruggen, Robert P. Vreeland, Tung-Ming Wang
ADJUNCT ASSOCIATE PROFESSOR: Gerald H. Batchelder
ASSISTANT PROFESSORS: David L. Gress, Dennis J. O'Brien

400. CIVIL ENGINEERING LECTURES
An introduction to the profession; the civil engineer as a planner, builder, and problem solver; and the goals of the civil engineer curriculum. Lectures by faculty and visitors. Required of Civ. Eng. freshmen; open to others by permission of instructor: 1 lec/0 cr. Cr/F.

404. ENGINEERING COMPUTER APPLICATIONS
The application of computers to typical engineering problems in surveying, route planning, construction management, etc. Prerequisite: Math 403 or equivalent. 2 lec/1 rec/2 cr.

501. SURVEYING
For non-civil engineering students. Theory and use of tape, level, transit, and aerial photographs in making plane and topographic surveys; use of surveys as a basis for deeds, maps, construction, design, environmental studies; reports involving the use of land or other natural resources. 2 lec/2 lab/4 cr.

505. SURVEYING
Principles of land measurements by ground and photogrammetric methods. Application of error theory to planning and adjusting engineering surveys. Conformal mapping and its application to state plane coordinate systems. Prerequisite: Civ. Eng. 404, Math 425-426. 3 lec / 2 lab / 4 cr.

508. ENGINEERING GRAPHICS
Orthographic projection and fundamentals of descriptive geometry. 2 lab/2 cr.

525-526-527. MECHANICS I, II AND III
Static and dynamic behavior of rigid and deformable bodies. Equilibrium, compatibility, and force-deformation relations; stress, strain, and constitutive relations; elastic stability; energy methods, stress and deformation in materials and simple structural elements. Review of particle dynamics; kinematics and kinetics of rigid bodies in two and three dimensions. Prerequisite: Math 425, Physics 407. 3 cr.

611. ENVIRONMENTAL PLANNING CONCEPTS
For students not in civil engineering. A nontechnical view of pressing urban and regional environmental problems emphasizing common characteristics and interrelationships. A systems approach to water quality and pollution, air pollution, thermal pollution, and transportation. New developments and approaches to these problems. Not open to Civ. Eng. majors. 4 cr.

621. TRANSPORTATION PLANNING AND DESIGN
Determining public transportation needs. Planning; the comparison and evaluation of alternative system modifications. Analysis of impacts of transportation facilities. Geometric design and traffic capacity of highways. Prerequisite: Civ. Eng. major or permission of instructor. 3 lec/3cr.

622. ENGINEERING MATERIALS
The structural properties and applications of the various materials used in civil engineering work, including steel, cement, mineral aggregates, concrete, timber, and bituminous materials. Micro-structure and properties of common metals, plastics, and ceramics. Prerequisite: Civ. Eng. 526. 3 lec/1 lab/4 cr.

623. SYSTEMS ANALYSIS
Quantitative and economic techniques for optimum allocation of resources in planning and design of physical systems. Calculus methods for constrained and unconstrained optimization problems, linear programming, dynamic programming, and benefit/cost economics. Case studies illustrate techniques in analyzing construction, structural, environmental, and transportation engineering problems. Prerequisite: Math 527 or equivalent. 3 lec / 3 cr.

642. FLUID MECHANICS
Properties of fluids, fluid statics, flow of incompressible and compressible ideal fluids, flow of real fluids, measurement of fluid properties, and the characteristics of flow through various measuring devices.3 lec/ 1lab/4 cr.

643. INTRODUCTION TO ENVIRONMENTAL POLLUTION CONTROL
Environmental engineering; causes and consequences of environmental pollution. Water pollution, air pollution, solid waste management, thermal pollution, radiological health, and occupational health. Prerequisites: Chem. 403. 3 lec / 3 cr.

644. WATER AND WASTEWATER ENGINEERING
Fundamental design concepts for operations and processes used in water treatment and water pollution control. Prerequisite: Civ. Eng. 643. 3 lec / 3 cr.

665. SOIL MECHANICS
Soil classification and physical properties. Permeability, compressibility, bearing capacity, settlement, and shear resistance are related to the behavior of soils subjected to various loading conditions. Prerequisite: Civ. Eng. 662, 642. 3 lec / 1 lab / 4 cr.

681. STRUCTURAL ANALYSIS
The analytical stress and deflection analysis of determinate structures under static and moving load. Computer solution of beams and trusses by classical and matrix methods. Prerequisite: Civ. Eng. 525-526. 3 lec/1 design period/4 cr.

682. STRUCTURAL DESIGN CONCEPTS
Structural synthesis and design; modeling concepts for analysis-design cycles by manual and computer approaches; development of design criteria; and general structural system behavior. Prerequisite: Civ. Eng. 681. 3 lec/1 design period/4 cr.

685. INDETERMINATE STRUCTURES
Analysis of indeterminate structures; non-prismatic members subject to static and moving loads. Solution by classical, numerical, and computer applied methods. Prerequisite: Civ. Eng. 681. 3 lec/1 design period/4 cr.

695. CIVIL ENGINEERING PROJECTS
Independent research, under faculty guidance, of a subject of particular interest to an individual or a small group. Prerequisite: approval of faculty member involved. 2-4 cr.

701. ADVANCED SURVEYING
Instrumental and analytical photogrammetry. Conformal mapping and its application to the state plane coordinate systems. Geodetic surveying. Error theory and its application to the planning and adjustment of surveys. Application of electronic computers to surveying calculations. Prerequisite: Civ. Eng. 505. 3 lec/1 lab/4 cr.

711. COMMUNITY PLANNING
Social, economic, and physical factors; content and extent of desirable programs—including purpose and scope; preliminary survey; elements of land planning; the master plan; transportation and circulation systems; patterns of land use; legal, financial, environmental, and economic problems. Prerequisite: permission of instructor. 4 lec/4 cr.

714. CONTRACTS, SPECIFICATIONS, AND PROFESSIONAL RELATIONS
Essential elements and legal requirements of engineering contracts; purposes and content of specifications; professional conduct, relations, registration, and ethics. Construction planning and management; cost analysis based on quantity surveys and unit-cost methods. Prerequisite: permission of instructor. 4 lec/4 cr.

721. PAVEMENT DESIGN
Flexible and rigid pavements and bases for highways, airports, and city streets; pavement selection, construction methods, materials, specifications, and engineering cost estimates. Prerequisite: Civ. Eng. 665. 3 lec/1 lab/4 cr.

731. NETWORK PLANNING AND SCHEDULING
Application of critical path methods (CPM) and project evaluation review technique (PERT) to the design and control of engineering projects. 1 lec / 1 lab / 2 cr.

743. ENVIRONMENTAL SAMPLING AND ANALYSIS
Laboratory exercises in the techniques of water, wastewater, and solid-waste sampling and analysis. Interpretation of results from pollution surveys and operation of pollution control facilities; statistics of sampling and statistical evaluation of analytical data. Prerequisite: Civ. Eng. 643 or consent of instructor. 1 lec/1 lab/2 cr.

745. HYDROLOGY AND HYDRAULICS
Occurrence and physical effects of water on the earth; meterology, ground-water runoff and stream-flow routing, open-channel flow, reservoirs, control works, hydroelectric power, irrigation, drainage, and multipurpose projects. Prerequisite: Civ. Eng. 642. 4 lec / 4 cr.

746. WASTEWATER TREATMENT PLANT DESIGN
Choice of treatment units. Design of the components; preparation of a plan for a particular city that includes a suitable combination of the units previously designed. Prerequisite: Civ. Eng. 644. 3 lec/1 design period/4 cr.

747. WATER TREATMENT PLANT DESIGN
Concepts, principles, and theory of plant design using a water source for a particular city and developing a treatment system for that community. Prerequisite: Civ. Eng. 644. 3 lec/1 design period/4 cr.

748. SOLID WASTE DISPOSAL
Basic concepts and theory of collection and disposal systems. Design methods involved in disposal systems. Prerequisite: Civ. Eng. 643 or consent of instructor. 3 lec/1 design period/4 cr.

751. TRANSPORTATION PLANNING
Transportation demand forecasting techniques applied to regional and urban situations. Calibration and use of mathematical models for forecasting land use, trip generation, trip distribution, modal choice, and trip assignment. Prerequisite: Tech 601 or equivalent. 3 lec/3 cr.

752. TRAFFIC ENGINEERING
Statistical and probabilistic methods to analyze and design roadway facilities. Level of service and capacity analysis of roadways under uninterrupted and interrupted flow conditions. Queuing theory and simulation models design of traffic facilities. Prerequisite: Tech 601 or equivalent. 3 lec/3 cr.

763. ADVANCED SOIL MECHANICS I
The physical and mechanical properties of soil in relation to engineering structures. The theory of consolidation, shearing resistance, bearing capacity, settlement, slope stability, earth pressure, and seepage studies. Prerequisite: permission of instructor. 4 lec/4 cr.

765. FOUNDATION ENGINEERING
Application of the principles of soil mechanics to selection of the type of substructure; determination of allowable soil-bearing capacities based on rupture and settlement theories; determination of active and passive earth pressures; and foundation construction methods. Prerequisite: Civ. Eng. 665, 682, and senior standing. 3 lec/1 design period/4 cr.

768. SEEPAGE THROUGH EARTH STRUCTURES
Groundwater flow, Darcy's Law, flow nets, Depuit's theory and application, conformal mapping techniques, confined flow, flow through earth and rock structures, seepage towards wells. Prerequisite: Civ. Eng. 642 and 665. 2 lec/2 cr.

782. TIMBER DESIGN
Properties and characteristics of structural woods, mechanics of wood, connection methods, design of timber members, and connections in beams, columns, and trusses, and glued laminates of wood. Prerequisite: Civ. Eng. 682 and permission of instructor. 1 lec / 1 design period / 2 cr.

784. STRUCTURAL ANALYSIS BY MATRIX AND NUMERICAL METHODS
Unifying concept of basic structural analysis theories; matrix and numerical methods of analysis, and their application by linear graph concepts using computers. Prerequisite: Civ. Eng. 685. 3 lec/1 design period/4 cr.

790. INELASTIC STRUCTURAL DESIGN
A continuation of modern design theory; ultimate design of reinforced concrete; plastic analysis of steel structures. 4 lec/4 cr.

793,794. ADVANCED STRUCTURAL DESIGN I AND II
Design in steel by elastic and plastic theories and in reinforced concrete by the working stress and ultimate strength methods for structural elements and connections using the appropriate controlling specifications. Prerequisite: Civ. Eng. 682 or permission of instructor. 3 lec/1 design period/4 cr.

795-796. INDEPENDENT STUDY
A limited number of qualified senior and graduate students will be permitted to pursue independent studies under faculty guidance. Seniors may write terminal theses reporting the results of their investigations. 2-4 cr.

Classics

(See Spanish and Classics)

Communication Disorders (COMM)

Chairperson: F. Harry Tokay

ASSOCIATE PROFESSORS: Frederick P. Murray, F. Harry Tokay
LECTURER: Elena F. Stuart

(520) 520. SURVEY OF COMMUNICATION DISORDERS
Causes, diagnosis, and treatment of speech, language, and hearing disorders. A prerequisite to all Com. Dis. courses. 4 cr.

521. ANATOMY AND PHYSIOLOGY OF THE SPEECH AND HEARING MECHANISM
Anatomy, physiology, neurology, and function of the mechanisms for the production and perception of speech. 4 cr.

524. APPLIED PHONETICS OF AMERICAN ENGLISH
International Phonetic Alphabet; its practical application to speech therapy and/or the student's professional interest. 4 cr.

631. SPEECH PATHOLOGY I
Normal development of speech and language. Research and therapy procedures as applied to communicative disorders, articulation and voice. 4 cr.

632. SPEECH PATHOLOGY II
Diagnosis, therapy, and counselling procedure applied to communication disorders; emphasis on stuttering, cleft palate, cerebral palsy, and aphasia. Prerequisite: Com. Dis. 631 or permission of instructor. 4 cr.

(634) 634. CLINICAL PRACTICE IN SPEECH PATHOLOGY
Supervised experiences in diagnosis and therapy with speech-handicapped children and adults. Experiences with school-age children in individual and group therapy. Prerequisite: Com. Dis. 524 and 632. 4 cr. Cr/F.

638. THE ACQUISITION OF LANGUAGE
Review of research and theories in speech pathology, education, linguistics, and learning theory related to development of language in the normal child. 4 cr.

(650) 650. PRINCIPLES AND PRACTICE OF PUBLIC SCHOOL SPEECH THERAPY
Principles, goals, and philosophy of public school speech and language therapy. Supervised practicum. Prerequisite: Com. Dis. 634. 1 lec/3 lab/4 cr.

(660) 660. SPECIAL PROBLEMS IN COMMUNICATION DISORDERS
Individual or group projects to enrich or expand theoretical knowledge and to afford an opportunity of applied experience. By permission and arrangement with faculty. May be repeated to a maximum of 8 credits. Variable 2, 4, 6, or 8 cr.

704. BASIC AUDIOLOGY
The normal hearing process and pathologies of the auditory system. Hearing screening, pure-tone testing, and speech audiometry. Prerequisite: Com. Dis. 521 or permission of instructor. 4 cr.

705. INTRODUCTION TO AUDITORY PERCEPTION AND AURAL REHABILITATION
Research, testing, and clinical procedures of auditory perception, applied to the communicatively impaired. Prerequisite: Com. Dis. 704 and permission of instructor. 4 cr.

780. SEMINAR IN DIAGNOSIS OF SPEECH AND LANGUAGE DISORDERS
Principles and practice for diagnosis of speech and language disorders; examination procedures and measurement techniques. Prerequisite: Com. Dis. 632. 4 cr.

(782). SEMINAR IN BEHAVIOR MODIFICATION OF SPEECH AND LANGUAGE DISORDERS
Application of operant-conditioning and desensitization procedures with communicative disorders. Analysis of therapy from a behavioral approach. Prerequisite: permission of instructor. 4 cr.

795 (795). INDEPENDENT STUDY
Application of the theory to specific communication disorder areas for individual or group projects. Prerequisite: permission of instructor. May be repeated to a maximum of 8 credits. Variable 2, 4, 6, or 8 cr.

Community Development

(See Institute of Natural and Environmental Resources)

Computer Science

(See Interdisciplinary Programs and Options and Math Program Description, Pages 62 and 83.)

Continuing Education Career Option Courses (DCE)

Director of Division of Continuing Education: Edward J. Durnall

Additional career option courses appear under Administration, Secretarial Studies, Recreation and Parks, and Merrimack Valley Branch, Library Science. Consult the Associate in Arts Degree chapter, Degree Options section, for specific course numbers.

599. SPECIAL TOPICS
Occasional course offerings of specialized material in: A.A. career options; general studies topics for non-traditional learners; travel/study programs. Prerequisite: permission of instructor. 1-4 cr.

Banking

440. MONEY AND BANKING
American financial system. How money is created and affects economy. Monetary policy. Pre- or corequisite: Cont. Ed. 530, or Economics 401. (Not open to students who have had Economics 635.) 4 cr. (Alternate years; offered spring 1977.)

(441). BANK OPERATIONS
Cash management and control, clearing and collections operations, loan and deposit administration, internal audit, and ancillary services. Pre- or corequisite: Cont. Ed. 460 or Administration 502. 4 cr. (Alternate years; offered spring 1978.)

(540). BANK INVESTMENTS
Investment and portfolio analysis in relation to bank operations; constraints affecting liquidity, safety, and profitability; types of securities; optional timing of investment transactions. Prerequisite: Cont. Ed. 440. 4 cr. (Alternate years; offered fall 1976.)

Criminal Justice

(550) 550. CRIMINAL JUSTICE ADMINISTRATION AND ORGANIZATION
Contemporary methods of administrative practice for efficient use of personnel, facilities, and equipment; planning and research; budgeting and control; decision-making; communications. 4 cr. (Every third semester; offered fall 1977.)

(551) 551. CRIME PREVENTION AND CONTROL
Coordinating the efforts of the community and criminal justice agencies. Problem-solving in specific crime analysis—the offense, the offender, and community environment. 4 cr. (Every third semester; offered fall 1976.)

(552) 552. CORRECTIONS TREATMENT AND CUSTODY
Scientific diagnosis and treatment of offenders. Institutional administration methods—climate, personnel, structure, and procedure. 4 cr. (Every third semester; offered spring 1977.)

Health Care Administration

(500) 500. INTRODUCTION TO HEALTH CARE SYSTEMS
Historical development and current structures; current legislation; private, voluntary, and governmental organizations; professional associations; standards, accreditation, certification, and licensure. 4 cr. (Not offered 1976-77 or 77-78.)

(501) 501. THE HEALTH CARE SYSTEM IN THE COMMUNITY
Medical, personal, therapeutic, and supportive care; psychology of patients; interaction of the health care team; long-term and hospital-based care. 4 cr. (Every third semester; offered fall 1977.)

(502) 502. MANAGEMENT OF HEALTH CARE FACILITIES
Environmental health, safety, and sanitation; local, state, and federal regulations; staff relationships and departmental organization. 4 cr. (Every third semester; offered fall 1976.)

(503) 503. LEGAL AND FISCAL RESPONSIBILITIES FOR HEALTH CARE FACILITIES ADMINISTRATORS
State and federal rules, regulations, and standards affecting accountability. 4 cr. (Every third semester; offered spring 1977.)

Insurance

(420) 420. PRINCIPLES OF INSURANCE
History, ethics, and the theory of risk. The major types of insurance. Operation and administration of an agency. 4 cr.

421. LIFE, ACCIDENT, AND HEALTH INSURANCE
Insurance programs for the individual. History; types of contracts; legal concepts; and government, group, and individual programs. 4 cr.

422. PROPERTY, LIABILITY, AND MARINE INSURANCE
Fire, casualty, transportation, marine, and aircraft insurance; fidelity and surety bonds; workmen's compensation; underwriting, loss adjustment, and prevention; government regulations, rate making, and reinsurance. 4 cr.

Management

(430) 430. MANAGEMENT PRINCIPLES AND ORGANIZATION
Management philosophy and practices; organization, structure, communication, planning, controlling, and decision-making. (Not open to Admin. or Hotel Admin. majors.) 4 cr.

(431) 431. HUMAN BEHAVIOR AND SUPERVISION
The nature of people at work, leadership, the informal organization, employee training and development, motivation, morale and performance appraisal, and counseling for improvements. (Not open to Admin. or Hotel Admin. majors) 4 cr.

(432) 432. PRINCIPLES OF ACCOUNTING
Sole proprietorship, partnership, and the corporation; recording, summarizing, and reporting data; systems to account for and control purchases, sales, cash, receivables, and inventory; valuation of assets and measurements of income. (Not open to students who have had Administration 502, to admitted bachelor's degree candidates, or to A.A. degree candidates in Accounting career option.) 4 cr.

(530) 530. ECONOMICS
U.S. economy and its component units. Macro- and micro-economic perspectives. (Not open to students who have had Econ. 401 or 402, or Resource Econ. 411.) 4 cr.

531. SALESMANSHIP
Principles and techniques of personal selling; customer needs and satisfaction. 4 cr.

532. BUSINESS LAW
Legal theory, practice, and precedents in everyday business situations. (Not open to students who have had Admin. 647.) 4 cr.

533. CREDIT MANAGEMENT
Credit—its effect on the money supply and its role in the economy; commercial and consumer borrowing; credit policy, analysis, and regulations; secured and unsecured credit; collections; receivables; management of credit and decision making. 4 cr.

Merchandising

(410). FUNDAMENTALS OF MERCHANDISING
Practices and procedures in marketing goods and services; retailing and wholesaling; channels of trade; functions of middlemen. (Not open to Admin. or Hotel Admin. majors.) 4 cr. (Alternate years; offered fall 1976.)

(411). PROMOTION AND ADVERTISING
Mass communications in marketing; use of advertising media; integration of promotional plans and sales techniques; evaluation of promotional efforts. (Not open to Admin. or Hotel Admin. majors.) 4 cr. (Alternate years; offered spring 1977.)

(510). RETAILING
Managing a goods or services retail enterprise; store location and organization, layout, buying and pricing, advertising and sales promotion, inventory control, and personnel policies. 4 cr. (Alternate years; offered fall 1977.)

Quality Control

(480). FUNDAMENTALS OF QUALITY CONTROL
Planning, organizing, staffing, and administering Quality Control operations in relation to company policy and objectives. 4 cr. (Alternate years; offered fall 1976.)

580. QUALITY CONTROL ENGINEERING
Pre-process, in-process, and post-process control techniques. Data accumulation, classification, evaluation, measurement, reporting, and costs. Prerequisite: Cont. Ed. 480 or permission of instructor. 4 cr. (Alternate years; offered spring 1977.)

581. STATISTICAL APPLICATIONS TO QUALITY CONTROL
Tendency and variation, normal curve applications, histogram analysis, control charts, sampling plans, and Dodge-Romig and Military Standard Tables. Prerequisites: Cont. Ed. 480 or permission of instructor, and college algebra or its equivalent. 4 cr. (Alternate years; offered fall 1977.)

582. PROCUREMENT QUALITY CONTROL
Optimizing the quality of incoming materials and supplies. Quality specifications, receipt, source inspection, and vendor surveys and ratings. Prerequisite: Cont. Ed. 480 or permission of instructor. 4 cr. (Alternate years; offered spring 1978.)

Real Estate

(425) 425. FUNDAMENTALS OF REAL ESTATE
History and development of property ownership; title and legal processes; limitations and restrictions of rights, contracts, and agreements; deeds and transfer of property. 4 cr.

(426). REAL ESTATE APPRAISAL
Principles of land and building analysis, cost estimation, depreciation, and influences affecting value of residential and commercial property. Prerequisite: Cont. Ed. 425. 4 cr.

(427). REAL ESTATE LAW AND FINANCE
Law: nature and classes of property; ownership; purchase and sales; and the rights, duties, and responsibilities of the broker.
Finance: mortgages; loans; and financing residential and commercial property. Prerequisite: Cont. Ed. 425. 4 cr.

Traffic and Distribution Management

(470). INTRODUCTION TO TRANSPORTATION AND TRAFFIC MANAGEMENT
The characteristics and operations of the various modes and classes—common, contract, exempt, and private. The relationship between distribution management and other operational activities. 4 cr.

(471) 471. CARRIER OPERATIONS
Principles of freight traffic; shipper-carrier relations. Terminal operations, freight handling, dispatching, inventory controls, employee relations, and other areas related to the operations portion of the transportation industry. 4 cr. (Every third semester; offered fall 1977.)

(570) 570. PRINCIPLES OF PHYSICAL DISTRIBUTION
Elements involved in physical distribution and their inter-relationships: inventory management, warehousing, industrial packaging, materials handling, physical flow, labor relations, cost control, forecasting. 4 cr. (Every third semester; offered fall 1976, spring 1978.)

(571) 571. TRANSPORTATION REGULATIONS
Relationships among federal, state, and international regulatory agencies and the modes and classes of transportation. Interstate Commerce Act application and interpretation; handling and filing of claims; documentation, export-import regulations; safety requirements; and labor contracts. Prerequisite: Cont. Ed. 470 or permission of instructor. 4 cr. (Every third semester; offered spring 1977.)

Cooperative Work Experience

(506) 506. FIELD EXPERIENCE
Supervised career-related work experience with pre-planned learning objectives, coordinated by the Division of Continuing Education and the cooperating employer. Prerequisites: admission to the A.A. with a declared career option, and permission of the DCE director. 2 or 4 cr. (May be repeated to a maximum of 8 credits.)

Merrimack Valley Branch Library Science Courses (MVB)

The following Merrimack Valley Branch courses are offered on the Durham campus of the University of New Hampshire as core courses in the Library Science career option in the Associate in Arts degree program.

401. INTRODUCTION TO LIBRARIES
History and role of libraries; role as a social institution; philosophy of library service; the tools, techniques, and routines of library work. 4 cr. (Alternate years; offered fall 1976.)

402. LIBRARY TECHNICAL SERVICES I
Dewey Decimal and Library of Congress classification systems; typing and filing cards; subject-heading theory and use; maintenance of shelf list and other files. 4 cr. (Alternate years; offered spring 1977.)

403. SUPPORT FOR PUBLIC SERVICES
Reference and bibliographic tools; philosophy of reference services; reference works in all types of libraries. 4 cr. (Alternate years; offered fall 1977.)

(501). NON-BOOK MATERIALS AND SERVICES
Technical organization and operation of audio-visual materials, services, and equipment. 4 cr. (Alternate years; offered spring 1978.)

502. LIBRARY TECHNICAL SERVICES II
Acquisition and processing of materials; the technical aspects of circulation systems. 4 cr. (Not offered in 1976-77 or 77-78.)

(503.) CHILDREN'S LIBRARY SERVICE
Materials for children; procedures and techniques for working with children; implementation of special programs; selection of materials; reference methods. 4 cr. (Not offered in 1976-77 or 77-78.)

Earth Sciences (ESCI)

Chairperson: Herbert Tischler

PROFESSORS: Donald H. Chapman, emeritus; T. Ralph Meyers, emeritus; Cecil J. Schneer, Herbert Tischler
ADJUNCT PROFESSOR: Robert I. Davis
ASSOCIATE PROFESSORS: Franz E. Anderson, Wallace A. Bothner, Henri E. Gaudette, Glenn W. Stewart
ASSISTANT PROFESSORS: Francis S. Birch, Wendell S. Brown, Theodore C. Loder, Paul A. Mayewski

401 (401). PRINCIPLES OF GEOLOGY I
The earth: a survey course covering earth materials (rocks and minerals), land forms, and the processes that form them (volcanism, earthquakes, glaciation, etc.). Field trips. 3 lec/1 lab/4 cr.

402. PRINCIPLES OF GEOLOGY II
The geological history of the earth: an interpretation of past geologic events emphasizing the geological development of North America and the evolution of life. Prerequisite: E.S. 401. 3 lec/1 lab/4 cr.

(409). ENVIRONMENTAL GEOLOGY
Environmental impact of geologic processes; natural hazards—landslides, earthquakes, volcanoes, flooding, erosion, and sedimentation; land exploitation and site investigations; environmental considerations of water supply problems; the recovery of energy and mineral resources. Prerequisite: E.S. 401 or permission of the instructor. 4 cr.

501 (501). INTRODUCTION TO OCEANOGRAPHY
Physical, chemical, geological, and biological processes in the sea. 3 lec/4 cr.

503 (503). INTRODUCTION TO MARINE SCIENCE
Team taught course under New Hampshire College and University Council. (NHCUC). Physical, geological, chemical, and biological aspects of the oceans. Field trips. Prerequisite: approval of E.S. Department. Saturday only. (No credit if completed E.S. 501). 4 cr.

(512). DESCRIPTIVE AND DETERMINATIVE MINERALOGY
Physical and chemical properties of minerals; their associations; modes of occurrence, and uses; identification. Prerequisite: E.S. 401 and Chem. 401 or 403 passed or taken concurrently. 2 lec/2 lab/4 cr.

531. STRUCTURAL GEOLOGY
Structural units of the earth's crust and mechanics of their formation. Prerequisite: E.S. 402. 3 lec/1 lab or field work/4 cr.

561. GEOMORPHOLOGY
Factors producing the present aspect of the land surface, particularly in New England. The work of running water, glaciers, and marine agents. Field trips during the fall season. Prerequisite: E.S. 401. 3 lec/1 lab/4 cr.

595. SPECIAL PROJECT IN THE EARTH SCIENCES
Section 1. Oceanography laboratory. Variable 1-4 cr.

603. MARINE SCIENCE SUMMER INSTITUTE
Six-week institute of three course offerings in marine-oriented disciplines. Lectures, labs, field trips, plus two weeks of intensive field work at the Cobscook Bay Marine Science Station. Student takes two out of the three courses. Prerequisite: approval of campus representative of the Marine Sciences Committee of the New Hampshire College and University Council, Dr. Theodore C. Loder. Not for major credit in Earth Sciences. 8 cr. (May be repeated.)

613. PRINCIPLES OF MINERALOGY
Introduction to crystallography; principles of the physics and chemistry of natural solids; atomic structures of minerals and their investigation by X-ray diffraction. Prerequisite: one year of college chemistry or permission of instructor. 3 lec/1 lab-rec/4 cr.

614. PETROGRAPHY
Description and classification of igneous, sedimentary, and metamorphic rocks in hand specimen and thin section; introduction to optical mineralogy. Prerequisite: E.S. 512. 2 lec / 2 lab / 4 cr.

(652). INVERTEBRATE PALEONTOLOGY
The classification and evolution and the environmental and stratigraphic significance of invertebrate animals as recorded by fossils. Field trip to collect fossils and examine ancient environments. Prerequisite: E.S. 402 or Zoology 412 or permission of instructor. 3 lec/1 lab/4 cr.

725. IGNEOUS AND METAMORPHIC PETROLOGY
Textural, mineralogical, and chemical analysis, and phase rule and phase diagram interpretation applied to petrogenesis. Prerequisite: E.S. 613, 614, or permission of instructor. 3 lec/1 lab/4 cr.

732. GEOLOGIC MAPPING AND INTERPRETATION
Standard methods of geologic field mapping; interpretation of geologic maps and aerial photographs of selected areas. Course includes field mapping excursions to local areas and an 8-10 day exercise in a selected area of the Appalachian Mountains. $60 lab fee includes transportation and housing in the field. Prerequisite: permission of instructor. 1 lec/1 lab/4 cr.

(734). APPLIED GEOPHYSICS
Gravity, magnetic, seismic, electrical, and thermal methods of investigating subsurface geology. Practical fieldwork and use of computers in data analysis. Prerequisite: Math 426 passed or taken concurrently, E.S. 401, and one year of college physics; or permission of instructor. 3 lec/1 lab/4 cr.

741. GEOCHEMISTRY
Thermodynamics applied to geological processes; geochemical differentiation of the earth; the principles and processes which control the distribution and migration of elements in geological environments. 3 lec/1 lab/4 cr.

(752.) CHEMICAL OCEANOGRAPHY
Water structure, chemical composition and equilibrium models, gas exchange, biological effects on chemistry, trace metals, and analytical methods. Laboratory includes short cruise aboard R/V Jere A. Chase. Prerequisite: permission of instructor. 3 lec/1 lab (optional)/3 or 4 cr.

(754.) SEDIMENTATION-STRATIGRAPHY
Sedimentation: weathering, transportation, and deposition of modern sediments. *Stratigraphy:* classification of sedimentary rocks and principles of stratigraphic correlation. 2 lec/1 lab/4 cr.

(758.) INTRODUCTION TO PHYSICAL OCEANOGRAPHY
Ocean basins; physical properties of seawater; atmosphere-ocean interaction; general ocean circulation; waves, tides, tsunamis, and gulf stream; continental shelf and near shore processes; instrumentation and methods used in ocean research. Simplified physical and mathematical models demonstrate the important concepts. Prerequisites: Physics 408, E.S. 501 or permission of the instructor. 3 lec/1 lab and field project/4 cr.

(759.) GEOLOGICAL OCEANOGRAPHY
Major geological features and processes of the ocean floor; geological and geophysical methods; plate tectonics. Prerequisite: E.S. 401, 501 or permission of instructor. 3 lec/4 cr.

762. GLACIAL GEOLOGY
Glacial environment: glaciers as agents of deposition; interpretation of glacial deposits. Review of world glacial stratigraphy in light of causes of glaciation and climatic change. Prerequisites: E.S. 401, 561, or permission of instructor. 3 lec/1 lab/4 cr.

781. PHYSICAL GEOLOGY
Materials and structures of the earth and erosive agents that modify them. Laboratory and field trips. For certified elementary or high school science teachers who need an introduction to the earth sciences. (Not available for credit after completing E.S. 401 or equivalent.) 4 cr.

782. HISTORICAL GEOLOGY
Evolution of physical features and life on the earth. Fossil organisms; methods of historical geology; laboratory and field trips. Prerequisite: E.S. 781 or equivalent. For certified elementary or high school science teachers who need an introduction to the earth sciences. (Not available for credit after completing E.S. 402 or equivalent.) 4 cr.

795. GEOLOGICAL PROBLEMS
1) Areal Geology; 2) Geochemistry; 3) Geomorphology, Advanced; 4) Geophysics; 5) Glacial Geology, Advanced; 6) Groundwater Geology; 7) Historical Geology, Advanced; 8) Industrial Minerals; 9) Micropaleontology; 10) Mineral Fuels; 11) Mineralogy, Advanced; 12) Optical Crystallography; 13) Ore Deposits; 14) Paleontology, Advanced; 15) Petrology, Advanced; 16) Regional Geology; 17) Sedimentation; 18) Stratigraphy; 19) Structural Geology, Advanced; 20) Marine Geology; 21) Physical Oceanography; 22) History of Geology; 23) Earth Science Teaching Methods; 24) Senior Synthesis; 25) Chemical Oceanography. Special problems by means of conferences, assigned readings, and field or laboratory work, fitted to individual needs from one of the areas listed above. 2 or 4 cr.

796. HONORS PROJECT
Independent research projects similar to E.S. 795 for students with 3.0, or better, average in Earth Sciences. 2 or 4 cr.

797. GEOLOGY COLLOQUIUM
Study of selected topics in both classical and modern geological thought. For majors. 0 cr. Cr/F.

Economics (ECON)

Program Director: William R. Hosek

PROFESSORS: Carroll M. Degler, emeritus; John A. Hogan, emeritus; Arthur W. Johnson, emeritus; Ruth J. Woodruff, emerita; Robert F. Barlow, Manley R. Irwin, John J. Korbel, Sam Rosen, Kenneth J. Rothwell, Dwayne Wrightsman
ASSOCIATE PROFESSORS: Allan J. Braff, William R. Hosek, Richard L. Mills, Robert C. Puth
ASSISTANT PROFESSORS: John M. Burt, Jr., Lawrence P. Cole, Philippe R. DeVille, Richard Hurd, Heidemarie Sherman, Allen R. Thompson
INSTRUCTOR: Marc Herold

(400) 400. ECONOMIC ISSUES
Economic analysis applied to varying current issues such as environmental pollution, federal deficit spending, monopoly and waste, poverty, racism, the energy shortage, the urban crisis, war and the economy, etc., discussed in a nontechnical, conceptual framework. Reports and discussion on outside readings. No credit towards a major or minor in economics. 4 cr.

401 (401). PRINCIPLES OF ECONOMICS (MACRO)
Basic functions of the United States economy viewed as a whole; policies designed to affect its performance. Economic scarcity, supply and demand, the causes of unemployment and inflation, the nature of money and monetary policy, the impact of government taxation and spending, the federal debt, and issues concerning economic growth. Not open to students who have had Resource Econ. 411. 4 cr.

(402) 402. PRINCIPLES OF ECONOMICS (MICRO)
Functions of the component units of the economy and their interrelations. Units of analysis are the individual consumer, the firm, and the industry. Theory of consumer demand and elasticity, supply and costs of production, theory of the firm under conditions of perfect and imperfect competition, demand for and allocation of economic resources, general equilibrium, and basic principles and institutions of international trade. 4 cr.

403, 404. HONORS ECONOMICS (MACRO, MICRO)
Special seminars for students who are capable of and interested in rapidly acquiring the tools of economic analysis to examine pressing contemporary problems and issues in depth. Student participation and interchange with other students and the instructor. Readings from popular and technical literature. Prerequisite: permission of instructor. 4 cr.

515. ECONOMIC HISTORY OF THE UNITED STATES
United States economy from Colonial times to the present. Models of economic development applied to the United States. How social, political, technological and cultural factors shape economy; development and influence of economic institutions. 4 cr.

518. EUROPEAN ECONOMIC HISTORY
Western European economies from medieval times to the present. Explanations for differential growth rates and patterns; contrasts between political, social, and economic events. Prerequisite: Econ. 401 (or) 402 or consent of the instructor. 4 cr.

525. INTRODUCTION TO ECONOMIC STATISTICS
Principal statistical concepts and techniques used in empirical economics: descriptive statistics, probability theory, random variables and their distributions, expected values, sampling, inferential statistics, correlation and regression analysis, analysis of variance, time series analysis, index numbers. Also, principal sources of economic data. Prerequisite: Mathematics 415 or equivalent. 4 cr.

601. INCOME DISTRIBUTION: WEALTH AND POVERTY
Examination of the distribution problem; historical development of distribution theories; comparative review of distribution systems, past and present. Students help select topics, e.g., distributive effects of the tax system and welfare policies to redistribute income. 4 cr.

605 (605). INTERMEDIATE MICROECONOMIC ANALYSIS
Analysis of supply and demand. Determination of prices, production, and the distribution of income in non-competitive situations and in the purely competitive model. General equilibrium. Prerequisite: Econ. 402. 4 cr.

611 (611). INTERMEDIATE MACROECONOMIC ANALYSIS
Macroeconomic measurement, theory, and public-policy determination. Prerequisite: Econ. 401, 402. 4 cr.

615. HISTORY OF ECONOMIC THOUGHT
Examination and critical appraisal of the work of major economists, including the work of contemporary economists, and major schools of economists, particularly with reference to the applicability of their theories to current economic problems. Prerequisite: Econ. 401, 402. 4 cr.

621. ECONOMIC DEVELOPMENT
Analysis of problems and available solutions confronting the underdeveloped areas of the world. Prerequisite: Econ. 401, 402. 4 cr.

626. INTRODUCTION TO QUANTITATIVE ECONOMICS
Development of the concept of a simple testable economic model of explanatory or forecasting type. Alignment of the model with reality by means of computer-performed statistical estimation. Types of error, consequences, and possible methods of dealing with errors. Prerequisite: Econ. 525. 4 cr.

630. COMPARATIVE STUDY OF ECONOMIC SYSTEMS
Theoretical models of capitalism and socialism. Their histroical implementation as exemplified by the United States, France, Yugoslavia, U.S.S.R., China, and Cuba. Prerequisite: Econ. 401, 402. 4 cr.

635 (635). MONEY AND BANKING
Financial markets, financial institutions, monetary theory, monetary policy, causes and cures of inflation and related problems. Prerequisite: Econ. 401, 402. 4 cr.

641. PUBLIC FINANCE
Analysis of the public sector. Welfare, optimality, and market failure in the private sector. Optimal provision of public goods; corrections for externalities; optimal public expenditure policy. Analysis of tax effects and incidence. Optimal taxation policies. Prerequisite: Econ. 401, 402. 4 cr.

645. INTERNATIONAL TRADE
Trade theory and commercial policy. Free trade, protection, common markets. Economic aspects of international relations with particular reference to recent policy issues. Prerequisite: Econ. 401, 402. 4 cr.

651. GOVERNMENT REGULATIONS OF BUSINESS
Mergers, competition, monopoly, and the regulated industries. 4 cr.

655. LABOR UNIONS AND THE WORKING CLASS
Workers' role in the economy and unions they form to protect their interests. History of the American labor movement; evaluation of the success of unions in fulfilling workers' needs. Management's relationship with workers in the context of a power struggle between unions and managers. Government role in collective bargaining as intermediary and as employer. 4 cr.

656. LABOR ECONOMICS
Functioning of labor markets from theoretical and policy perspectives. Labor supply, wage determination, internal labor markets, and barriers to upward labor market mobility. Poverty, unemployment, inflation, and wage-price controls. Prerequisites: Econ. 401, 402 or permission of instructor. 4 cr.

695-696. INDEPENDENT STUDY
Individual projects of special interest and benefit. Prerequisite: permission of Undergraduate Counselor and proposed project supervisor. Granted to students with unusual initiative. Variable (in multiples of 2) 2-12 cr.

698. TOPICS IN ECONOMICS
Special topics. May be repeated. Prerequisite: consent of instructor. 4 cr.

711. ECONOMIC FLUCTUATIONS
Recurrent movements of prosperity and depression; emphasis on causes and public-policy implications. Prerequisite: Econ. 611 or permission of instructor. 4 cr.

715. MARXIAN ECONOMIC ANALYSIS
Marx's analysis of capitalism within the classical and radical tradition; methodology; organization of capital; labor theory of value; accumulation of capital; growth and distribution; economic crises. Critical evaluation of Marx's analysis. Prerequisites: Econ. 605 and 611 or consent of the instructor. 4 cr.

720. U.S. ECONOMIC HISTORY
From Colonial times to the present. Applied economic theory; economic models and interpretation of data. Influence of technology, industrialization, foreign trade, monetary factors, and government; non-economic factors. Prerequisite: Econ. 605, 611; or consent of instructor. 4 cr.

721. EUROPEAN ECONOMIC HISTORY
Western European and Mediterranean economies from medieval times to the Common Market. Economic models and interpretation of data. Capital accumulation, technology, trade, industrialization, monetary factors, and the role of government; relevant non-economic factors. Prerequisite: Econ. 605, 611, or consent of instructor. 4 cr.

722. CASE STUDIES IN ECONOMIC DEVELOPMENT
Problems and policies in selected countries; evaluations of national plans, programs, and projects; comparative analysis. Sections: 1) Southeast Asia; 2) Cost-Benefit and Project Analysis; 3) Africa; 4) South America. Prerequisites: Econ. 401, 402; or consent of instructor. 4 cr.

725. STATISTICAL THEORY
Univariate and bivariate mathematical statistics; i.e., probability theory, discrete and continuous random variables and their distributions, moments and moment-generating functions, parameter estimation, hypothesis testing, correlation and regression analysis, analysis of variance. Prerequisites: Math 425-426 or equivalent. 4 cr.

726. MATHEMATICAL ECONOMICS
Principal mathematical techniques and their application in economics. Prerequisite: permission of instructor. 4 cr.

727. INTRODUCTION TO ECONOMETRICS
Representation of economic phenomena in mathematical terms; formulation of models of economic activity and the derivation therefrom of propositions which are subject to statistical test, primarily by means of multivariate regression analysis. Prerequisite: Econ. 725 or permission of instructor. 4 cr.

746. INTERNATIONAL FINANCE
International monetary mechanism; balance of payments; international investment; exchange rates, adjustment systems, international liquidity, foreign aid, multinational corporations. Prerequisite: Econ. 401, 402. 4 cr.

758. MANPOWER AND EDUCATION PLANNING
Flows of human beings within and between the educational and manpower sectors of the economy, also related to flows of goods and services in the industrial sector. Interrelationships of these flows; construction of a computer simulation-model tracing the impact throughout the economy of manpower and educational-planning decisions. Prerequisite: Econ. 401, 402; or consent of instructor. 4 cr.

761. NATIONAL ECONOMIC PLANNING
Planning in a market economy: the new industrial state. Planning as a substitute tor markets: the developing countries. Planning as a way of transforming society; socialist economies; techniques of planning social and political issues related to various planning methods. Prerequisite: Econ. 605, 611; or consent of instructor. 4 cr.

768. SURVEY OF UR8AN ECONOMICS
Theoretical and empirical bases; policy alternatives for the problems of poverty, housing, urban renewal, transportation, local fiscal affairs, and pollution. Prerequisite: Econ. 605 or permission of instructor. 4 cr.

798. SEMINAR IN ECONOMIC PROBLEMS
Special topics; may be repeated. Prerequisite: consent of adviser and instructor. 2 or 4 cr.

Education (EDUC)

Chairperson: Gerald J. Pine

PROFESSORS: Everett B. Sackett, dean emeritus; Thomas O. Marshall, emeritus; Angelo V. Boy, Roland B. Kimball, Carleton P. Menge, Gerald J. Pine
ADJUNCT PROFESSORS: Donald D. Durrell, Frederick M. Jervis
ASSOCIATE PROFESSORS: Michael D. Andrew, Charles H. Ashley, Jason E. Boynton, John G. Chaltas, David D. Draves, Edward D. Durnall, David J. Hebert, Bud B. Khleif, Joseph J. Petroski, M. Daniel Smith, Deborah E. Stone, Dwight Webb
ADJUNCT ASSOCIATE PROFESSOR: Peter Cimbolic
ASSISTANT PROFESSORS: Margaret D. Ackerman, Richard Antonak, Virginia F. Bereit, John J. Carney, Ellen Corcoran, Michael C. Diamonti, Ann L. Diller, Sidney Eder, Leo Geoffrion, Edward J. Lawton, Jeanette Miccinati, Stephen Murphy
ADJUNCT ASSISTANT PROFESSOR: John R. Cavanaugh
RESIDENT SUPERVISORS: Sue Adames, Paul Aldrich, Jay Barry, Marceline Boomer, Richard Brown, Les Carter, Bill Cartey, Thomas Conway, Robert Dodge, George Drinkwater, David Faichney, Shirl Foster, Barbara Gondak, Carolyn Grenert, George Griewank, Sue Haley, Carolyn Hardman, Barbara Hudson, Richard Jannell, Robert Kozacka, Alide Lavalle, Mildred Lyons, Jacquelyn McCusker, Peter McGee, Marie Myers, Peggy McShea, Warren Palmeria, Joanne Peterson, Norman Richardson, William Rowell, Priscilla Royal, David Townley, Charles Vaughn

COORDINATOR OF TEACHER EDUCATION: Michael D. Andrew

(500) 500. EXPLORING TEACHING
For students considering a teaching career. In-school experiences to develop introductory skills in observation and teaching. On-site seminars for analysis and evaluation. Assessment and advisement related to teaching as a career provided. Prerequisite for further work toward teacher certification. A minimum of seven hours a week, plus travel time, required. Prerequisite: departmental permission. 4 cr. Cr/F.

(611). TEACHING ELEMENTARY SCHOOL SOCIAL STUDIES
Objectives, content, methods, and materials. (Offered in Division of Continuing Education only.) 4 cr.

(612). TEACHING ELEMENTARY SCHOOL MATHEMATICS
Objectives, content, methods, and materials. (Offered in Division of Continuing Education only.) 4 cr.

(613). TEACHING ELEMENTARY SCHOOL SCIENCE
Involvement strategies; inquiry and discovery approaches compared with more conventional methods; selection and justification of goals. Survey of resources available for science teachers; analysis of current curriculum projects. (Offered in Division of Continuing Education only.) 4 cr.

(691). SCIENCE CURRICULUM AND INSTRUCTION
For inservice and preservice secondary teachers of physics, chemistry, earth science, or general science. Modern curricula and methods; contemporary programs of national interest. Science teaching goals and methods. 4 cr.

(694) 694. COURSES IN SUPERVISED TEACHING
Supervised Teaching of Physical Education. 8 cr. Cr/F.
Supervised Teaching of Occupational Education. 8 cr. Cr/F.
*Supervised Teaching of Art. 8 cr. Cr/F.
*Supervised Teaching of English, 8 cr. Cr/F.
*Supervised Teaching of Social Studies. 8 cr. Cr/F.
Supervised Teaching of Home Economics. 8 cr. Cr/F.
*Supervised Teaching of Foreign Language. 8 cr. Cr/F.
*Supervised Teaching of Mathematics. 8 cr. Cr/F.
Supervised Teaching of Music. 8 cr. Cr/F.
*Supervised Teaching of Science. 8 cr. Cr/F.

(700) 700. EDUCATIONAL STRUCTURE AND CHANGE
Organization, structure, and function of American schools; processes of change in education; how successful innovation is accomplished. Field experience options. Variable-credit modules. Sections listed in Department prior to preregistration. Prerequisite: Ed. 500 or permission of instructor. Minimum of 4 cr. required for teacher certification. Variable 1-4 cr.

701 (701). HUMAN LEARNING AND DEVELOPMENT
Individual development; learning process analysis. Variable-credit modules on the theories, research, and implications of a specific topic offered each semester and summer. Sections listed in Department prior to preregistration. Prerequisite: Ed. 500 or permission of instructor. Minimum of 4 cr. required for teacher certification. Variable 1-4 cr.

703 (703). ALTERNATIVE TEACHING MODELS
Analysis and application of basic teaching models and techniques (from very teacher-directed to very student-centered). Observation of master classroom teachers and exemplary videotapes; service as aides to master-teachers; seminars. Techniques and analysis systems through observation of video-tapes, micro-teaching, completion of appropriate self-instruction units, and seminars. Variable credit modules; sections listed in Department prior to preregistration. Prerequisite: Ed. 500 or permission of instructor. Minimum of 4 cr. required for teacher certification. Variable 1-4 cr.

705 (705). ALTERNATIVE PERSPECTIVES ON THE NATURE OF EDUCATION
Students formulate, develop, and evaluate their own educational principles, standards and priorities. Alternative philosophies of education; contemporary educational issues. Variable credit modules; sections listed in Department prior to preregistration. Prerequisite: Ed. 500 and departmental permission. Minimum of 4 cr. required for teacher certification. Variable 1-4 cr.

(706). INTRODUCTION TO READING INSTRUCTION IN THE ELEMENTARY SCHOOLS
The reading process; current procedures and materials; diagnostic techniques; clinical experience. Course satisfies reading requirement for prospective elementary teachers in the five-year teacher-education program and may be included in the 12 required graduate credits in Education at the graduate level. Course may also be taken for undergraduate credit prior to entrance into fifth year; in this case the course satisfies reading requirement but is not applicable toward the 12 required graduate credits. 4 cr.

(707). APPROACHES TO TEACHING READING AT THE SECONDARY LEVEL
The Reading Curriculum in the Secondary School. Analysis of the structural components (developmental, corrective, remedial); materials and methods of instruction and appraisal; instruments of measurement and evaluation in the comprehensive secondary reading program. 2 cr. *Teaching Reading through the Content Areas: Alternative and Application.* Students learn new approaches, concepts, and methodologies of teaching reading; workshop to develop and produce instructional strategies and materials for an integrated reading-content program. 2 cr.

*These courses will be available to all classes up to and including the graduating class of 1977.

734. CHILDREN'S LITERATURE
Interpretive and critical study of literature for children in the elementary, middle, and junior high schools. Methods of using literature with children. 4 cr.

742. SUPERVISED TEACHING IN THE ELEMENTARY SCHOOL
For majors only. 16 cr.

(750). SURVEY OF DEVELOPMENTAL DISABILITIES
Nature of handicaps; psychological and educational problems; causal factors; evaluation; learning potential; and general characteristics. Emphasis on mental retardation. 4 cr.

(751). TEACHING THE DEVELOPMENTALLY DISABLED CHILD
Development of skills for children with mental retardation, physical impairments, and sensory defects. Students will teach a child with mental retardation and a child with either a physical or sensory impairment, and prepare case studies. 4 cr.

(752). DIAGNOSIS AND REMEDIATION OF LEARNING DISABILITIES
Terminology, etiology, common characteristics, symptoms. Theory and practice in gross-motor, visual, and auditory-testing procedures used in diagnosis. Test findings for use in remediation programs. 4 cr.

(753). TEACHING THE CHILD WITH EMOTIONAL AND SOCIAL DIFFICULTIES
Nature and scope of emotional disturbances and social maladjustment in children including causes, characteristics, and treatment programs. 2 cr.

(763). INTRODUCTION TO EDUCATIONAL MEDIA
Educational media in the learning process; curricular integration of materials and equipment in the school library media center; design and implementation of learning systems that provide a framework for the development of individual skills. 4 cr.

(785). EDUCATIONAL TESTS AND MEASUREMENTS
The theory and practice of educational evaluation; uses of test results in classroom teaching and student counseling; introductory statistical techniques. 4 cr.

795, 796. INDEPENDENT STUDY
Juniors and seniors only with approval by appropriate faculty member. 2 or 4 cr.

(797). SEMINAR IN CONTEMPORARY EDUCATIONAL PROBLEMS
Issues and problems of special contemporary significance, usually on a subject of recent special study by the staff member(s). Prerequisite: permission of instructor(s). May be repeated for different topics. Variable 1-4 cr.

Electrical Engineering (E E)

Chairperson: Joseph B. Murdoch

PROFESSORS: Leon W. Hitchcock, emeritus; Fletcher A. Blanchard, Ronald R. Clark, Albert D. Frost, John B. Hraba, Joseph B. Murdoch, Alden L. Winn
ADJUNCT PROFESSOR: Sidney W. Darlington
ASSOCIATE PROFESSORS: Glen C. Gerhard, Filson H. Glanz, Donald W. Melvin, John L. Pokoski, Kondagunta Sivaprasad, Kerwin C. Stotz
ASSISTANT PROFESSOR: Michael R. Cannon, Paul J. Nahin
INSTRUCTORS: Byrg E. Bonnelyeke, Charles F. Walker

401. INTRODUCTION TO ELECTRICAL ENGINEERING I
Overview of electrical engineering profession; lectures by faculty and guests and field trips. Role of the electrical engineer as a professional; ethics of the engineering profession. Required of electrical engineering freshmen. 1 cr. Cr/F.

402. INTRODUCTION TO ELECTRICAL ENGINEERING II
Introduction to electrical network theory with attention given to computerized network analysis. Prerequisite: Math 425. Required of EE. freshmen. 1 cr.

431. SPEECH, MUSIC, AND NOISE: THE SCIENCE OF SOUNDS
Physical nature of sound waves. Production of sounds: by mechanical vibration in string instruments, drums, loudspeakers, or by air column resonances in horns and organ pipes. Characteristics of hearing and the human perception of sound, loudness, pitch, and intensity. Speech communication and the acoustics of the classroom, theater, or concert hall. Noise, its control and reduction; criteria for the judgement of annoyance. Application of acoustics and noise control for environmental protection and in industry, transportation, biology, and medicine. Amplification, storage, and reproduction of sound. Open for credit to non-engineering and non-physics students only. Prerequisite: high school mathematics. 3 lec/1 lab/4 cr.

432. LIGHT: SOURCES AND USES
Edison's lamp to the laser; production of light; color, the spectrum, and the human eye; sources of light; lenses and reflectors; the four factors of seeing; designing lighting installations. Applications in schools, offices, factories, stores, the home; for sports and recreation, agriculture, and medicine; the ocean; and public buildings. Open for credit to non-engineering and non-physics students only. Prerequisite: high school algebra and trig. 3 rec/1 lab/4 cr.

517. JUNIOR LABORATORY I
Application of techniques in electrical engineering. Prerequisite: E.E. 551 taken concurrently. 1 lab/1 cr.

518. JUNIOR LABORATORY II
Laboratory investigations synthesizing classroom knowledge in circuits, electronics, electromagnetics, and signal processing. Prerequisite: E.E. 552 and 654 should be taken concurrently with 518, otherwise they must be completed prior to 518. 1 lec/2 labs/3 cr.

531. ELEMENTS OF DIGITAL SYSTEMS
Fundamental design and analysis principles. Number systems, switching algebra, logic circuits, codes, and an introduction to digital computers. Laboratory: student-built systems using modern integrated circuit technology; "hands-on" experience with a minicomputer. For non-E.E. majors. 3 rec / 1 lab / 4 cr.

533. ELECTRONICS AND INSTRUMENTATION FOR ENGINEERS
For civil and chemical engineering students. DC and AC circuits, electronic devices, power supplies, amplifiers, digital circuits, transducers, and recording systems. Prerequisite: Physics 408, Math 527. 3 lec/1 lab/4 cr.

541-542. ELECTRICAL CIRCUITS I & II
Electrical circuits including DC, AC, and transient circuits. Linear circuit theory, power considerations, resonance conditions, Fourier series, Laplace transforms, and complex frequency analysis. Prerequisite: Math 426, E.E. 402 or equivalent experience. 3 rec/1 lab/4 cr.

543. INTRODUCTION TO DIGITAL SYSTEMS
Fundamental design and analysis principles. Number systems, switching algebra, logic circuits, codes, and an introduction to digital computers. Laboratory: student-built systems using modern integrated circuit-technology; "hands on" experience with a minicomputer. For E.E. majors. 2 rec/1 lab/3 cr.

544. SIGNAL PROCESSING FUNDAMENTALS
Methods of analysis for distributed systems, continuous and discrete signals and introductory probability and statistics for engineers. Prerequisite: Math 527. 3 rec / 3 cr.

548. ELECTRONICS I
Semiconductor and vacuum device characteristics; mathematical and equivalent circuit models. Amplifier performance specifications; circuit analysis and design techniques for linear small-signal and power amplifiers at audio, radio, and video frequencies. Prerequisite: Math 527, E.E. 542 (latter may be taken concurrently). 3 lec-rec, or 2 lec/1 lab/3 cr.

551. ELECTRONICS II
Feedback theory, analysis and design with operational amplifiers, sinusoidal oscillators, modulators, detectors, and analog circuits. Prerequisite: E.E. 548 and 607 (latter may be taken concurrently). 3 lec-rec, or 2 lec / 1 lab / 3 cr.

552. ELECTRONICS III
Analysis and design of digital and switching circuits using both discrete and integrated components. Prerequisite: E.E. 543 and 551. 3 lec-rec, or 2 lec/1 lab/3 cr.

603. ELECTROMAGNETIC FIELDS AND WAVES I
Electrostatic field in free space, conductors, and dielectrics; capacitors; Laplace and Poisson's equations; magnetostatic fields in free space and ferromagnetic materials; magnetic circuits; inductors; Faraday's law. Prerequisite: Math 527. E.E. 544 or equivalent. 3 cr.

604. ELECTROMAGNETIC FIELDS AND WAVES II
Maxwell's equations for time-varying fields; relation between field and circuit theory; plane waves in dielectric and conducting media; reflection and refraction of waves in isotropic media; transmission lines, wave guides, and resonators; antennas and radiation. Prerequisite: E.E. 603. 3 cr.

605. ELECTRONIC PROPERTIES OF MATERIALS AND DEVICES
Nature of the electron, energy levels and bonds, and semiconductor materials. Electronic transport properties of conductors and semiconductors, PN junction theory, physics and characteristics of transistors, thermionic emission and the vacuum tube. Prerequisite: Physics 408, completion of chemistry requirements, E.E. 548, and Math 527. 4 cr.

607. ELECTRICAL CIRCUITS III
Two ports, Fourier transforms, state equations, passive, active, and digital filters. Prerequisite: E.E. 542. 3 rec/3 cr.

608. INTRODUCTION TO COMMUNICATION AND CONTROL
Modeling and simulation of physical systems. Examples of open and closed loop control systems. Signal representation, modulation, and detection methods in communication systems. Multiplexing and coding. Prerequisites: E.E. 607, E.E. 552 taken concurrently. 3 rec, or 2 rec/1 lab/3 cr.

609. ELECTRONIC MATERIALS AND DEVICES
The structure of materials, energy levels, energy bands, semi-conductor statistics. Electronic transport phenomena, PN junction theory, physics of transistors. Thermionic emission, photo-conductivity, and dielectric and magnetic properties of solids. Prerequisite: E.E. 552 and 604, Physics 408, and completion of the chemistry requirement. 3 rec / 1 lab / 3 cr.

620. ELECTRONICS AND INSTRUMENTATION
For non-engineering and non-physics students; no mathematical or engineering detail. Techniques for using electronic instruments and equipment. DC and AC circuits, electronic amplifiers, grounding and shielding problems, transducers, electronic instruments, schematic reading, transients, noise problems, and digital techniques. Prerequisite: junior standing. 3 rec / 1 lab / 4 cr.

654. ELECTROMECHANICAL ENERGY CONVERSION
Theory and analysis of transformers and electromechanical energy converters. Prerequisite: E.E. 603 and 542. 3 rec/3 cr.

656. ELECTROMECHANICAL DEVICES
Theory and analysis of transformers, rotating machines, transducers and control system components, and other energy conversion methods. Prerequisite: E.E. 603 and 542. 3 rec/1 lab/4 cr.

695 (695). ELECTRICAL ENGINEERING PROJECTS
Laboratory or advanced study course. Student either joins a department research project or engages in a project in an area of staff interest. Prerequisite: acceptance by staff member. 1-4 conf or 1-2 lab/variable cr.

711. DIGITAL SYSTEMS
Extension of E.E. 543 to advanced switching theory techniques (design of unclocked sequential circuits, minimization of multiple output circuits, etc.) and digital design tools (L.S.I., multiplexing, etc.) Applications featured. Prerequisite: E.E. 543 or permission of instructor. 3 rec/1 lab/4 cr.

712. LOGICAL DESIGN OF DIGITAL COMPUTERS
Computer architectures, including arithmetic, memory, control, and input-output units; the trade-offs between hardware, software, and cost. "Hands on" laboratory experience with machine language programming, interfacing of peripherals, etc., on minicomputers and microcomputers. Prerequisite: E.E. 543 or permission of instructor. 3 rec/1 lab/4 cr.

714. MINICOMPUTER APPLICATIONS ENGINEERING
Organization and operation of minicomputer-based systems. Interfacing of special purpose peripherals, data structures, control structures, program and data organization, microprogramming, real-time monitor systems. Applications to communication, automated-measurement, and process control systems. Prerequisite: E.E. 543 and programming experience, or permission of instructor. 3 rec/1 lab/4 cr.

727. POWER SYSTEMS
Modeling and planning of electric power transmission systems. Prerequisite: E.E. 654. 4 cr.

741. FLUID CONTROL SYSTEMS
The mathematical modeling of hydraulic-, pneumatic-, and fluidic-control elements and control systems. Methods are developed for the analysis of systems using gases or liquids as the working fluid. Methods for the synthesis of the parameters of the control elements, used in automatic control systems, are developed and methods of design of these systems are discussed. 4 cr. (Also offered as M.E. 741.)

745. FUNDAMENTALS OF ACOUSTICS
Acoustic wave equation for air; laws of reflection, refraction, and absorption; characteristics and measurement of acoustical sources; microphones; sound level; acoustical materials; ultrasonics; architectural acoustics. Prerequisite: Physics 408, Math 527. 3 rec/1 lab/4 cr.

757. FUNDAMENTALS OF COMMUNICATIONS
Communication systems, Fourier analysis of signals, AM and FM detection, digital and sampled-data signals, noise in electrical circuits. Prerequisite: E.E. 608 and permission of instructor. 3 rec / 1 lab / 4 cr.

758. COMMUNICATION SYSTEMS
Design of high frequency communication systems. RF amplification, modulators for AM and FM systems, receiving techniques, antennas, free space propagation, propagation characteristics of the ionosphere. Prerequisite: E.E. 604, 757 or equivalent. 3 rec/1 lab/4 cr.

762. ILLUMINATION
Radiation; color and spectra; physics of light production; sources of ultra-violet, visible, and infrared energy; lamp circuitry; control of light; lighting design, applications of light in business, industry, school, home and outdoors. Open to juniors and seniors in engineering and physics. 3 rec/1 lab/4 cr.

775. APPLICATIONS OF INTEGRATED CIRCUITS
The design and construction of linear and nonlinear electronic circuits using existing integrated circuits. Use of operational amplifiers. Laboratory course in practical applications of non-digital integrated circuit devices. 4 cr.

781. OCEAN INSTRUMENTATION PROJECT
Interdisciplinary solution of a real-world problem; measurements of physical, chemical, or biological parameters in an ocean or fresh-water environment. Student team formulates system specification, assembles components, and designs a test procedure for demonstrating the feasibility of the prototype system. Written final report and oral demonstration before a panel of invited experts. Prerequisite: senior standing in Engineering. 4 cr.

782. CONTROL SYSTEMS
Fundamental principles involved in the design and analysis of feedback control systems. Topics include stability criterion, time-domain analysis, frequency-domain analysis, and introduction to nonlinear systems. Prerequisite: permission of instructor. 3 rec / 1 lab / 4 cr. (Also offered as M.E. 782.)

783. BIOMEDICAL ENGINEERING
Engineering applied to cardiovascular, renal, gastrointestinal, sensory, reproductive, and other organ systems. Topics will include design and utilization of diagnostic, monitoring, and prosthetic techniques and devices. A design-oriented project will be required. Prerequisite: a human physiology course (may be taken concurrently). 3 rec/1 lab/4 cr.

784. BIOELECTRONICS
Principles of physiological and biological instrumentation design including transducers, signal conditioning, recording equipment, and patient safety. Laboratory includes the design and use of the electrocardiogram, electromyogram, electroencephalogram, pulse monitors, and electronic thermometers.Current research topics, such as biotelemetry, ultrasonic diagnosis, and computer applications are also included. Prerequisite: permission of instructor. 3 rec / 1 lab / 4 cr.

(785). UNDERWATER ACOUSTICS
Vibrations, propagation, reflection, scattering, reverberation, attenuation, sonar equations, ray and mode theory, radiation of sound, transducers, and small and large signal considerations. Prerequisite: permission of instructor. 4 cr.

786. INTRODUCTION TO RADIO ASTRONOMY
Electromagnetic radiation, propagation. Positional astronomy and the radio sky, discrete radio sources, source structure distribution, the sun as a radio source, flare and burst activity, planetary emissions, quasars, pulsars, techniques of observation and data reduction, radiometry, polarimeters, correlation interferometers, aperture synthesis. Prerequisite: senior or graduate status in Engineering and Physical Sciences. 4 cr.

796 (796). SPECIAL TOPICS IN ELECTRICAL ENGINEERING
New or specialized courses and/or independent study. Prerequisite: permission of instructor. 2 or 4 cr.

Engineering Technology (E T)

Program Director: Donald Melvin

Permission of instructor is a prerequisite to all Engineering Technology courses.

633. INDUSTRIAL ORGANIZATION AND LAW
Corporations; partnerships; product liability; contracts; O.S.H.A. and safety codes; collective bargaining; types of compensation; agencies; small claims. 4 cr.

634. ECONOMICS OF BUSINESS ACTIVITIES
Elementary financial accounting; compound interest and time value of money; sources of capital; budgeting of resources; depreciation; risk and insurance; marketing and sales. 4 cr.

637. HEAT AND FLUID POWER I
Introduction to power systems; nature of fluids-phases, state points, properties; continuity relationships; work and heat; First Law of thermodynamics; cycles: Carnot, Rankine, gas, refrigerator; Second Law and reversibility. 3 lec / 1 lab / 4 cr.

638. HEAT AND FLUID POWER II
Fluid statics; Euler, Bernoulli, and energy equations; nozzle flow; rotating systems—turbines and pumps; viscosity and sheer stresses; pressure drop in pipes; heat transfer; heat exchangers. Prerequisite: E.T. 637. 3 lec/1 lab/4 cr.

641. PRODUCTION SYSTEMS
Production standards—sources, uses; manufacturing capacity—design, analysis; manufacturing inventories and their control; production scheduling; production control. 4 cr.

644. DYNAMICS OF MACHINERY
Static forces in linkages and mechanisms; kinematics of plane motions; dynamic forces in linkages and mechanisms; force and stress measurements; vibrations; balancing of machines; reciprocating engines. 4 cr.

651. MECHANICAL ENGINEERING TECHNOLOGY PROJECT I
Group project in which the students are required to find solutions to actual technological problems. In general this process will involve design, fabrication and testing. 4 cr.

653. MECHANICAL ENGINEERING TECHNOLOGY PROJECT II
Similar to E.T. 651. Student projects to widen experience. 4 cr.

654. MECHANICAL ENGINEERING TECHNOLOGY PROJECT III
Group project activity as a continuation of ET—651 effort which may or may not be an extension of the work done in E.T. 651. 4 cr.

671. INDUSTRIAL ELECTRONICS
Review of transient analysis; introduction to Laplace transforms; timing circuits; transducers; silicon controlled rectifier circuits; motor controls. 3 lec/1 lab/4 cr.

674. CONTROL SYSTEMS AND COMPONENTS
Feedback principles; stability, Nyquist criteria; performance charts; introduction to equalizer design; control system components. 3 lec/1 lab/4 cr.

675. ELECTRICAL TECHNOLOGY I
Electrical circuits—D C and A C; polyphase circuits; transformers; D C and A C machinery and their control; physical principles of electronic devices. 3 lec/1 lab/4 cr.

676. ELECTRICAL TECHNOLOGY II
Equivalent circuits of electronic devices; power supplies; transistor amplifiers—frequency response; introduction to digital electronics; transducers and instrumentation systems. 3 lec/1 lab/4 cr.

677. INTEGRATED ELECTRONICS
Regulators—power supplies; operational amplifier characteristics—errors, frequency response, compensation; operational amplifier applications—amplifiers, waveshaping, filters, oscillators; other types of integrated circuits. 3 lec/1 lab/4 cr.

680. COMMUNICATIONS AND FIELDS
Modulation and demodulation; noise, introduction to filter design; introduction to electric and magnetic fields; transmission lines; waveguide principles and components; antennas and radiation. 3 lec/1 lab/4 cr.

691. ELECTRICAL ENGINEERING TECHNOLOGY PROJECT I
Group project in which the students are required to find solutions to actual technological problems in design, fabrication, and testing. 4 cr.

693. ELECTRICAL ENGINEERING TECHNOLOGY PROJECT II
Similar to E.T. 691. Student projects to widen experience. 4 cr.

694. ELECTRICAL ENGINEERING TECHNOLOGY PROJECT III
Group project activity as a continuation of E.T. 691 effort which may or may not be an extension of the work done in E.T. 691. 4 cr.

English (ENGL)

Chairperson: Donald Murray

PROFESSORS: Sylvester H. Bingham, emeritus; Robert C. Webster, emeritus; Max S. Maynard, emeritus; Robert Hapgood, Edmund G. Miller, Donald M. Murray, Philip L. Nicoloff, John C. Richardson, Thomas Williams, John A. Yount
ASSOCIATE PROFESSORS: Thomas A. Carnicelli, Carl Dawson, Michael DePorte, Karl Diller, Lewis C. Goffe, Gary H. Lindberg, Terence P. Logan, Charles D. Simic, Mark R. Smith, Theodore Weesner
VISITING ASSOCIATE PROFESSOR: Jean Kennard
ASSISTANT PROFESSORS: Earl F. Briden, S. Anthony Caldwell, Lester A. Fisher, Elizabeth H. Hageman, Annette Kolodny, Andrew H. Merton, Hugh M. Potter, Alan H. Rose, Susan Schibanoff, David V. Siddall

301. IMPROVEMENT IN WRITING
Required of all students whose attainments in the fundamentals of English are found to be unsatisfactory. 3 rec/0 cr. Cr/F.

302. IMPROVEMENT IN READING
Intensive drill in reading skills for six weeks. 3 rec/0 cr. Cr/F.

303. ENGLISH AS A SECOND LANGUAGE
Speaking, reading, and writing for students to whom English is a foreign language. 0 cr. Cr/F.

401 (401). FRESHMAN ENGLISH
Training to write more skillfully, and to read with more appreciation and discernment. Frequent individual conferences for every student. 4 cr.

English 401, or exemption from it, is a prerequisite for all other English courses.

(402) 402. FRESHMAN SEMINARS—APPROACHES TO LITERATURE
Intensive study of a specific topic, theme, genre, major figure, or period of English or American literature. *No credit toward the English major.* For details, see the course descriptions available in department office and from freshman advisers. 4 cr.

501 (501). INTRODUCTION TO PROSE WRITING
Non-fiction writing; weekly papers and frequent conferences. May be repeated for credit with the approval of department chairperson. 4 cr.

512. INTRODUCTION TO AMERICAN LITERATURE
Works of major American writers from Irving to Faulkner, with emphasis on how to adapt and present the material to high school English classes. Open only to English Teaching majors. 4 cr.

513,514. INTRODUCTION TO ENGLISH LITERATURE
Selected classic works in poetry and prose considered in chronological order and historical context. Attention to the works and to the ideas and tastes of their periods. 513: Beowulf through 18th century. 514: 1800 to the present. 4 cr.

515,516. A SURVEY OF AMERICAN LITERATURE
515: From the beginning of American literature to the Civil War. 516: From the Civil War to the present. 4 cr.

518. THE BIBLE AS LITERATURE
Literature of the Old and New Testaments and the Apocrypha, primarily in the King James version. 4 cr.

519(519). INTRODUCTION TO CRITICAL ANALYSIS
Critical analysis of fiction, poetry, and drama. Frequent short papers. Required of all English majors; should be taken early in their programs. 4 cr.

(520)520. LITERATURE AND THE HISTORY OF IDEAS
An interdisciplinary study of literary works as influenced and illuminated by the concepts of philosophers, historians, and scientists. Barring duplication of subject, may be repeated for credit. 4 cr.

521. THE NATURE WRITERS
Fiction, poetry, and non-fiction books on the natural environment. Such books as Thoreau's *Walden* or *Maine Woods*, Leopold's *Sand County Almanac*, Beston's *Outermost House*, Dillard's *Pilgrim at Tinker Creek*, books by naturalists who observe nature vividly and knowingly and who write out of their concern for the environment. 4 cr.

(522). AMERICAN LITERARY FOLKLORE
Folktales, songs, proverbs, beliefs, superstitions, and their use by such American authors as Irving, Hawthorne, Longfellow, Melville, Thoreau, Twain, Frost, and Faulkner; some emphasis on oral folk culture of New Hampshire. 4 cr.

523. MADNESS IN LITERATURE
How various writers depict insanity, and how they approach the problem of determining what attitudes and what behavior are truly sane. Emphasis on 19th and 20th century works, but works form earlier periods also considered. Euripides, *The Bacchae*, Shakespeare, *King Lear*, Cervantes, *Don Quixote*, Hoffmann, *The Golden Pot*, Dostoyevsky, *Notes from the Underground*, Robbe-Grillet, *The Voyeur*, and Nabokov, *Pale Fire*. 4 cr.

(524). WOMEN IN LITERATURE
Women writers and the presentation of women in literature from biblical times to the present. Content and approach vary depending on instructor but may include such topics as "Rebellious Women," "Crazy Ladies," "19th-Century American Women," and "The Woman as Artist." 4 cr.

525. POPULAR CULTURE IN AMERICA
Cultural expression in popular media. Verbal arts (best sellers, magazines, newspapers, speeches); some attention to television, film, comics, popular music. The multidisciplinary approach deals with historical context, cultural institutions, and distinctions between "popular arts" and "great literature." Recurrent images, situations, and themes will be investigated to see what values are celebrated and fears revealed. 4 cr.

(530)530. INTRODUCTION TO POETRY
20th century American and British poetry. Various poetic techniques and their demonstration. Student gains a fuller understanding of the genre. 4 cr.

531(531). INTRODUCTION TO DRAMA
Nature and types of drama illustrated by major English, American, and (translated) European plays. How to read a play. Live and filmed performances studied as available. 4 cr.

(532)532. INTRODUCTION TO FICTION
Modern novels and/or short stories. The ways in which fiction communicates its meanings; the tools and methods at the fiction writer's disposal, primarily as they function in individual works. 4 cr.

533(533). INTRODUCTION TO FILM
Film: history, technique, and social relevance; as an art form. Comparison of film to drama and the novel. Showing and examination of works by such film makers as Bergman, Fellini, Truffaut, Kurosawa, Hitchock, and Welles. 4 cr.

595. LITERARY TOPICS
Various faculty members investigate topics of special interest at a level appropriate for non-majors. See department for details of current offerings. 4 cr.

621(621),622. NEWSWRITING
Workshops to develop reporting and writing skills. Prerequisite: Engl. 501 or its equivalent and permission of the instructor. May be repeated for credit with the approval of the department chairperson. 4 cr.

625-626. WRITING FICTION
A workshop in the fundamental techniques of fiction writing. Student work is criticized by fellow students; individual conferences with instructor. Prerequisite: Engl. 501 or equivalent. Written permission of instructor required for registration. May be repeated for credit with the approval of the department chairperson. 4 cr.

627-628. WRITING POETRY
A workshop in the fundamental techniques of poetry writing. Class discussion and criticism of poems written by students. Individual conferences with instructor. Prerequisite: Engl. 501 or equivalent. Written permission of instructor required for registration. May be repeated for credit with the approval of the department chairperson. 4 cr.

651,652. COMPARATIVE LITERATURE
Comparative studies of major authors representative of important periods of world literary achievement. 651: Homer to Dante; common themes and the development of the epic tradition in early Western literature. 652: Renaissance to Modern. Topics and approaches vary from semester to semester. 4 cr.

695,696. SENIOR HONORS
Open to senior English majors who, in the opinion of the department, have demonstrated the capacity to do superior work in English. Open to seniors by departmental invitation only. May be counted as two courses toward the ten which constitute a major in English. 4 cr.

697,698. SENIOR SEMINARS
Intensive study of specialized topics which vary from year to year. Enrollment in each seminar is limited to 15 so that all students can take an active part in discussion and work closely with the instructor on their papers. Exceptional sophomores and juniors may be admitted with permission of the instructor. For details, see the course description available in the department office. 4 cr.

701-702. ADVANCED WRITING OF FICTION
Workshop discussion of advanced writing problems and readings of students' fiction. Individual conferences with instructor. Prerequisite: 625-626 or equivalent. Written permission of instructor required for registration. May be repeated for credit with the approval of the department chairperson. 4 cr.

703-704. ADVANCED NON-FICTION WRITING
A workshop course for students intending to write publishable magazine articles or non-fiction books. Equal stress on research and writing techniques. Prerequisite: 621; 622 recommended. Written permission of instructor required. May be repeated for credit with the approval of the department chairperson. 4 cr.

705-706. ADVANCED WRITING OF POETRY
Workshop discussion of advanced writing problems and submitted poems. Individual conferences with instructor. Prerequisite: 627-628 or equivalent. Written permission of instructor required for registration. May be repeated for credit with the approval of the department chairperson. 4 cr.

707(707). FORM AND THEORY OF FICTION
A writer's view of the forms, techniques, and theories of fiction. The novels, short stories, and works of criticism studied will vary, depending on the instructor. 4 cr.

(708)708. FORM AND THEORY OF NON-FICTION
A writer's view of contemporary non-fiction, emphasizing the choices the writer faces in the process of research and writing. 4 cr.

709(709). FORM AND THEORY OF POETRY
A writer's view of the problems, traditions, and structures of poetry. 4 cr.

710. CRITICAL ANALYSIS OF FICTION
An analytic study of the modes of modern fiction (popular, pictorial, dramatic, lyrical); advanced critical writing and methodology. Prerequisite: Engl. 519 or permission of instructor. 4 cr.

711. CRITICAL ANALYSIS OF POETRY AND DRAMA
Emphasis on modern poetry and drama and on the art of writing critically about particular literary works. Prerequisite: Engl. 519 or permission of instructor. 4 cr.

(712)712. CRITICAL ANALYSIS OF EXPOSITION
For the English Teaching major; students analyze essays and write non-fiction prose. Variety of critical approaches; several methods of teaching composition. 4 cr.

713,714. LITERARY CRITICISM
Major critics from Plato to the present and the chief critical approaches to literature. 4 cr.

715. APPLIED LINGUISTICS
Methods of teaching and learning foreign languages; background work on theories of language acquisition; the methodology of teaching English as a second language. Students interested in teaching other languages may do their projects on those languages. 4 cr.

716. PROBLEMS IN APPLIED LINGUISTICS
Variable topics course; problems such as language acquisition in children and adults, bilingualism, and linguistic field methods. 4 cr.

718. ENGLISH LINGUISTICS
Introduction to the study of language; dialects and social and psychological problems of language; intensive work on the techniques of modern grammar (syntax, phonology, semantics). 4 cr.

719. ENGLISH GRAMMAR
Traditional and contemporary approaches to the study of the structure of the English language: its history, phonology, morphology, syntax, including consideration of parts of speech, phrases, clauses, sentences, etymology, punctuation. Some emphasis on the teaching of English grammar. 4 cr.

(720)720. NEWSPAPER INTERNSHIP
Students intending to pursue careers in journalism spend a semester working full- or part-time for a daily newspaper under close supervision of editors. Reporting is stressed, but the student may do some editing as well. The number of internships is very limited. Prerequisite: Engl. 621 or its equivalent and permission of instructor. Variable, max. 16 cr.

742. PURITANISM AND THE ENLIGHTENMENT IN AMERICA
American literature and thought from the Colonial beginnings through the early republic. 4 cr.

743. AMERICAN TRANSCENDENTALISTS
Detailed study of the writings and influence of Emerson, Thoreau, Fuller, Whitman, and other transcendentalists. 4 cr.

744. AMERICAN FICTION TO THE CIVIL WAR
Cooper, Poe, Hawthorne, Melville, Stowe, and others. Recurrent themes, cultural and social backgrounds, and narrative techniques. 4 cr.

746. AMERICAN LITERATURE, 1865-1915
Fiction, poetry, and prose in the era of industrialism, realism, naturalism, big money, and minute concern with daily life. Works studied individually and in relation to the cultural background. Mark Twain, Henry James, William James, Dickinson, Crane, Chopin, Dreiser, Wharton, and others. 4 cr.

747,748. AMERICAN FICTION AND DRAMA OF THE 20TH CENTURY
747: Major writers from World War I to World War II. 748: Major writers since World War II. 4 cr.

749. AMERICAN POETRY OF THE 20TH CENTURY
Frost, Pound, Eliot, Williams, Stevens, Hart Crane, Robert Lowell, Plath, and others. 4 cr.

750. MAJOR AMERICAN AUTHORS
Selected works by two or three American writers. Possible topics include: Melville and Faulkner, Hawthorne and James, Frost and Stevens. See department for details on current offerings. 4 cr.

751(751). MEDIEVAL EPIC AND ROMANCE
The two major types of medieval narrative; comparative study of works from England, France, Germany, and Iceland, including *Beowulf, Song of Roland, Niebelungenlied,* Gottfried's *Tristan,* Njal's *Saga,* and Malory's *Morte d'Arthur.* All works read in modern English translations. 4 cr.

(752)752. HISTORY OF THE ENGLISH LANGUAGE
Evolution of English from the Anglo-Saxon period to the present day. Relations between linguistic change and literary style. 4 cr.

753. OLD ENGLISH
Introduction to Old English language and literature through readings of selected poetry and prose. 4 cr.

754. BEOWULF
A reading of the poem and an introduction to the scholarship. Prerequisite: Engl. 753. 4 cr.

755,756. CHAUCER
755: *Troilus and Criseyde,* in the context of medieval continental literature by Boccaccio and other influences. 756: *The Canterbury Tales.* 4 cr.

757,758. SHAKESPEARE
757: Ten major plays representative of the main periods of Shakespeare's career and the main types of drama which he wrote (tragedy, comedy, history). Live and filmed performances included as available. 758: A few plays studied more intensively. 4 cr.

759. MILTON
Milton and his age. Generous selection of Milton's prose and poetry, with secondary readings of his sources and contemporaries. 4 cr.

763. CONTINENTAL BACKGROUNDS OF THE ENGLISH RENAISSANCE
Major philosophers, artists, and writers of the continental Renaissance (in translation); Petrarch, Ficino, Pico, Vives, Valla, Castiglione, Machiavelli, Luther, Calvin, Rabelais, Montaigne, Cervantes, Erasmus, and Thomas More, as representative of the early English Renaissance. 4 cr.

764. PROSE AND POETRY OF THE ELIZABETHANS
Shakespeare and his contemporaries. Major works, including Spenser's *Fairie Queene,* Sidney's *Astrophil and Stella,* Shakespeare's *Sonnets,* Marlowe's *Dr. Faustus*: their literary and intellectual backgrounds. 4 cr.

765. ENGLISH LITERATURE IN THE 17TH CENTURY
Major writers of the 17th century, including Donne, Jonson, Herbert, Bacon, and Hobbes. 4 cr.

767,768. LITERATURE OF THE RESTORATION AND 18TH CENTURY
Representative works; texts studied closely; the ways they reflect the central intellectual problems of their age. 767: Dryden, Rochester, Restoration plays, Bunyan, Defoe, Montesquieu, and Swift. 768: Pope, Fielding, Johnson, Boswell, Voltaire, Sterne, Rousseau, Beckford, Diderot, and Blake. 4 cr.

769,770. THE ENGLISH ROMANTIC PERIOD
Major literary trends and authors, 1798 to 1832. Focus on poetry but attention also to prose works and critical theories. 769: Wordsworth, Coleridge, Lamb, Hazlitt, DeQuincey; 770: Byron, Shelley, Keats. 4 cr.

771,772. VICTORIAN PROSE AND POETRY
Major writers; social and cultural history. Typically included in 771, Carlyle, Ruskin, Newman, Tennyson, Browning, and others; in 772, Arnold, the Pre-Raphaelites, Swinburne, Hopkins, and others. 4 cr.

773,774. BRITISH LITERATURE OF THE 20TH CENTURY
Poets and novelists; the concept of modernity in literature. Offerings vary by year and by instructor, but normally include such figures as Joyce, Lawrence, Yeats, Woolf, Forster, and more contemporary writers such as Burgess, Fowles, Murdoch, and Golding. 4 cr.

775(755). IRISH LITERATURE
Survey from the beginnings to the present; works in Irish (read in translation) such as *The Cattle Paid of Cooley,* medieval lyrics, and *Mad Sweeney;* and works in English from Swift to the present. 20th century authors: Joyce, Yeats, Synge, O'Casey, Beckett, and Flann O'Brien. 4 cr.

781. ENGLISH DRAMA TO 1800
Development from the Middle Ages through the 18th century, emphasizing the Elizabethan-Jacobean contemporaries of Shakespeare (Marlowe, Jonson, Webster). Selected plays from the middle ages, the Restoration period, and the 18th century. 4 cr.

782. MODERN DRAMA
Major English, American, and (translated) European plays of the modern period by such playwrights as Shaw, Ibsen, Chekhov, Strindberg, Pirandello, O'Neill, Brecht, Beckett, Williams, Miller, Pinter. Live and filmed performances studied as available. 4 cr.

783. THE ENGLISH NOVEL OF THE 18TH CENTURY
The rise and development of the novel through study of selected major works by Defoe, Richardson, Fielding, Smollett, Sterne, and Austen. 4 cr.

784. THE ENGLISH NOVEL OF THE 19th CENTURY
Representative novels from among Austen, Scott, Dickens, Thackery, Emily Bronte, Charlotte Bronte, Trollope, George Eliot, Hardy, and Conrad. 4 cr.

791-792. ENGLISH EDUCATION—PROBLEMS IN THE TEACHING OF HIGH SCHOOL ENGLISH
Methods and techniques in teaching language, composition, and literature in grades 7-12. Required of all students in the English-Teaching Major. Open to others with permission of instructor. No credit toward the English Major. 2 cr.

793. PHONETICS AND PHONOLOGY
The sounds and sound systems of English in the context of linguistic theory: comparisons of English to other languages. Prerequisite: a basic linguistic course or permission of the instructor. 4 cr.

794. SYNTAX AND SEMANTIC THEORY
The relation of grammar and meaning with special reference to poetic language. 4 cr.

795,796. INDEPENDENT STUDY
Open to highly qualified juniors and seniors both semesters but for a maximum of 4 credits. To be elected only with permission of the department chairperson and of the supervising faculty member or members. Barring duplication of subject, may be repeated for credit.

797,798. SPECIAL STUDIES IN LITERATURE
1) Old English Literature; 2) Medieval Literature; 3) The Renaissance; 4) 17th Century; 5) 18th Century; 6) English Romantic Period; 7) Victorian Period; 8) 20th Century; 9) Drama; 10) Novel; 11) Poetry; 12) Non-Fiction; 13) American Literature; 14) A Literary Problem. The precise topics and methods of each section will vary. Barring duplication of subject, may be repeated for credit. For details, see the course descriptions available in the English Department. 4 cr.

Entomology (ENTO)

Chairperson: G. Thomas Fisher

PROFESSORS: James G. Conklin, emeritus; Robert L. Blickle
ASSOCIATE PROFESSORS: G. Thomas Fisher, J.M. Macklin, R. Marcel Reeves
ASSISTANT PROFESSOR: James S. Bowman
ADJUNCT ASSISTANT PROFESSOR: Arthur H. Mason

400. INSECTS: THEIR ROLE AS MAN'S GREATEST COMPETITOR
Insects and their relations to man, his environment, and his activities. Not for major credit. Mr. Fisher. 2 lec/3 cr.

(402). INTRODUCTORY ENTOMOLOGY
The structure, biology, and classification of insects. For students contemplating majors in entomology, wildlife management, biology, or biology-education. Each student has to make an insect collection. Mr. Fisher. 3 lec/1 lab/4 cr.

503. PRINCIPLES OF ECONOMIC ENTOMOLOGY
The nature of insect damage and the methods of insect control. Mr. Bowman. 3 lec/4 cr.

507. FOREST ENTOMOLOGY
Especially for forestry majors. The structure, development, classification, and control of representative forest insects. Each student has to make an insect collection. Mr. Reeves. 3 lec/1 lab/4 cr.

704. MEDICAL ENTOMOLOGY
Especially for students interested in public health or medicine. Insects and arachnids in relation to public health; the biology and control of important disease carriers. Elective for juniors and seniors. Mr. Blickle. 2 lec/1 lab/4 cr.

707,708. ADVANCED ENTOMOLOGY
R1) Taxonomy; R2) Morphology; R3) Aquatic Insects; R4) Insect Physiology. Required of Entomology majors; open to others by permission of instructor. Mr. Blickle, Staff. 2 lec / 1 lab / 4 cr.

709,710. ADVANCED ECONOMIC ENTOMOLOGY
R1) Agricultural Entomology; R2) Biological Control of Insects; R3) Chemical Control of Insects; R4) Regulatory Entomology; R5) Structural Pest Control. Required of Entomology majors; open to others by permission of instructor. Hours arr. Mr. Fisher, Staff. 4 cr.

Environmental Conservation

(See Institute of Natural and Environmental Resources)

Environmental Engineering

See page 50.

Forest Resources

(See Institute of Natural and Environmental Resources)

French and Italian

Chairperson: Grover E. Marshall

PROFESSOR: Louis J. Hudon
ASSOCIATE PROFESSOR: Jack R. Vrooman
ASSISTANT PROFESSORS: Rose T. Antosiewicz, Lydia L. Crowson, Grover E.Marshall
VISITING ASSISTANT PROFESSOR: Samuel Gatteño
LECTURERS: Anthony Di Sanzo, Louis J. Iandoli

French (FREN)

New students will be assigned to proper courses on the basis of their scores on the College Board Achievement test and on departmental placement tests given at the first meeting of each course. All courses in the department are conducted in French unless otherwise noted. Junior and senior non-majors may write papers and examinations in English in courses numbered 600 and above. French 605-606 is the first course counting toward a major. Students educated in French-speaking countries may not register for courses below the 700 level. Transfer credit will not be given for elementary-level college courses in foreign languages if the student had two or more years of the foreign language in secondary school.

401-402. ELEMENTARY FRENCH
For students without previous training in French. Aural comprehension, speaking, writing, reading. No credit for Fr. 401 without Fr. 402. (No credit for students who have had two or more years of French in secondary school; however, any such student, whose study of French has been interrupted for a significant period of time, should consult the department chairperson about possibly receiving credit.) 5 rec/labs/4 cr.

501. INTERMEDIATE FRENCH
Similar to Fr. 503, below, but for students with less preparation. Prepares for Fr. 504. 5 rec/labs/4 cr.

503-504. INTERMEDIATE FRENCH
Intensive reading of complete texts, formal review of grammar, training in oral and written expression of ideas. 3 rec/labs/4 cr.

(514) 514. FRENCH GRAMMAR AND SPEECH
Thorough review of grammar and practice in oral and written expression. Prerequisite: Fr. 504. 3 rec/labs/4 cr.

605-606. READINGS IN FRENCH LITERATURE
Analysis of texts from the 17th century to the present. Prerequisite: grade of C or better in Fr. 504. 3 rec/4 cr.

620. THE NOVEL OF QUEBEC
Novel of Quebec as a reflection of a society, its attitudes and development. Readings in French. Taught in French or English as circumstances dictate. Papers and examinations in English for non-majors. Prerequisite: French 504 or equivalent. 4 cr.

621. FRENCH PROSE IN TRANSLATION
Works affecting French thought from the Renaissance to the modern period. Readings, discussion, papers in English. Not for major credit. 4 cr.

622. FRENCH DRAMA IN TRANSLATION
Major works of comedy, tragedy, and drama. Moliere and Racine to the present day. Readings, discussions, papers in English. Not for major credit. 4 cr.

685-686. JUNIOR YEAR AT DIJON UNIVERSITY
Studies at the University of Dijon (France) for juniors who have completed their sophomore year at UNH and have passed with a grade of B or better Fr. 605-606 and Fr. 514. Students are expected to take French courses in their freshman and sophomore years. Attendance required at orientation sessions during the second semester of sophomore year. Interested students should consult the director of the program. Not offered for graduate credit. Prerequisite (non-majors): permission of major department. 32 cr. Cr/F.

(741). FRENCH LITERATURE OF THE MIDDLE AGES
Epic, lyric poetry, and romance. Prerequisite: Fr. 606. (Offered irregularly.) 4 cr.

(742). FRENCH LITERATURE OF THE RENAISSANCE
Prerequisite: Fr. 606. (Offered irregularly.) 4 cr.

759-760. FRENCH LITERATURE OF THE 17th CENTURY
Prerequisite: Fr. 606. 4 cr. (Alternate years; offered 1977-78.)

761-762. 18th CENTURY FRENCH LITERATURE AND THOUGHT
Prerequisite: Fr. 606. 4 cr. (Alternate years; offered 1976-77.)

767-768. 19th CENTURY FRENCH LITERATURE
Romanticism and Realism. Prerequisite: Fr. 606. 4 cr. (Alternate years; offered 1977-78.)

(770). INTRODUCTION TO MODERN FRENCH POETRY
Baudelaire to the present. Prerequisite: Fr. 606. (offered irregularly.) 4 cr.

781-782. CONTEMPORARY FRENCH NOVEL AND THEATER
From 1890 to the present. Prerequisite: Fr. 606. 4 cr. (Alternate years; offered 1976-77.)

790. ADVANCED LANGUAGE AND STYLE
Translation of literary texts, intensive study of principal techniques of style,*explication de textes* Prerequisite: at least two courses in French numbered 741 and above. 4 cr.

791. METHODS OF FOREIGN LANGUAGE TEACHING—FRENCH
Interdepartmental course. Objectives, methods, and techniques in teaching Spanish, French, German, and Latin from elementary grades through college. Discussion, demonstration, preparation of instructional materials, microteaching of the language skills. Prerequisite: permission of instructor. Not for major credit. (Same as German 791, Latin 791, and Spanish 791.) 4 cr.

795,796. SPECIAL STUDIES IN FRENCH LANGUAGE AND LITERATURE
Individual guided study of the work of a major author, a genre, or specific topics in literature. Training in bibliography and organization of material. Prerequisite: permission of the department chairperson. Variable credit.

798. SEMINAR IN FRENCH LITERATURE
Topics chosen by the instructor. Prerequisite: Fr. 606. 4 cr.

Italian (ITAL)

New students will be assigned to the proper course upon consultation with the department. Students educated in Italian-speaking countries may not register for courses below the 700 level. Transfer credit will not be given for elementary-level college courses in foreign languages if the student had two or more years of the foreign language in secondary school.

401-402. ELEMENTARY ITALIAN
For students without previous training in Italian. Aural comprehension, speaking, writing, reading. No credit for It. 401 without It. 402. (No credit for students who have had two or more years of Italian in secondary school; however, any such student, whose study of Italian has been interrupted for a significant period of time, should consult the department chairperson about possibly receiving credit.) 5 rec/labs/4 cr.

503-504. INTERMEDIATE ITALIAN
A complete review of the fundamentals of grammar and syntax. Selected readings as a general introduction to Italian civilization and culture. 3 rec/labs/4 cr.

795,796. INDEPENDENT STUDY IN ITALIAN LANGUAGE AND LITERATURE
Individual guided study. Prerequisite: permission of the department chairperson. Variable credit.

Geography (GEOG)

Chairperson: William H. Wallace

PROFESSOR: William H. Wallace
ASSOCIATE PROFESSOR: Robert G. LeBlanc
ASSISTANT PROFESSOR: Robert L.A. Adams
LECTURER: James W. Cerny

401,402. REGIONAL GEOGRAPHY OF THE WORLD
Surveys of the major culture areas and the unique integration of human and physical phenomena that produce the distinctive character of these areas. 401: Western culture areas—Europe, the Americas, Australia, and New Zealand. 402: Non-Western culture areas—Black Africa, the Dry World, Oriental Asia, and the Pacific. 4 cr.

473 (473). THE WEATHER
Analysis of the elements and controls of weather; emphasis on interpreting the nature and variability of New England weather. (*Does not satisfy the Social Science requirement.*) 4 cr.

(511). GEOGRAPHY OF ANGLO-AMERICA
Regional and topical analysis of the United States and Canada. Relation of physical features and human phenomena to the character of the area. 4 cr. (Alternate years)

531. GEOGRAPHY OF WESTERN EUROPE AND THE MEDITERRANEAN
Regional and topical analysis. Patterns of natural phenomena, cultural features, and economic systems. 4 cr. (Alternate years.)

570. INTRODUCTORY CLIMATOLOGY
Analysis of the characteristics and world distribution of present climates. Climates of the past and theories of climatic change. Man's adjustment to and modification of climate. (*Does not satisfy the Social Science Requirement.*) 4 cr.

572. PHYSICAL GEOGRAPHY
Factors in the formation and distribution of landforms, soils, and vegetation. Human significance of nature. (Does not satisfy the Social Science Requirement.) 2 lec/1 lab/4 cr. (Alternate years.)

581. CULTURAL GEOGRAPHY
The differentiation of the world in terms of population, race, language, religion, and economy. Historical origin and the diffusion of these phenomena. 4 cr. (Alternate years.)

582. ECONOMIC GEOGRAPHY
The areal variation of the earth in terms of man's production, exchange, and consumption of economic goods. Development and application of various theories of location. 4 cr. (Alternate years.)

590. INTRODUCTORY CARTOGRAPHY
Map usage, design, and execution. Emphasis on special purpose thematic maps used in scholarly papers, theses, journals, and books. 4 cr.

610. THE GEOGRAPHY OF NEW ENGLAND
The distinctive physical setting of New England, its settlement and development during the past three centuries, and the present-day problems and opportunities of the region. Three required weekend field excursions near the end of the term. Prerequisite: permission of instructor. 4 cr. (Alternate Years.)

612. GEOGRAPHY OF FRENCH CANADA
French Canadian culture: its distinctiveness, the reasons for its persistence, and the probablility of its continued viability. Natural environment, exploration and settlement, economic change, population chage, migration, development of a bicultural society, and the social, ecomomic, and political aspects of the Quiet Revolution. Required 5- or 6-day field trip to Quebec. Prerequisite: permission of instructor. 4 cr. (Alternate years.)

683. HISTORICAL GEOGRAPHY OF THE UNITED STATES
The spatial analysis of Indian economic life in 1492 and of European exploration, colonization, population change, economy, urbanization, and ethnicity to 1900. Geographic illusions and their significance. 4 cr. (Alternate years.)

690. ADVANCED CARTOGRAPHY
An opportunity to pursue individual interests while sharing in the work of the instructor and other students. Map symbolization, map perception, computer mapping, map projection, surface analysis. Prerequisite: Geog. 590 or permission of instructor. 4 cr.

795 (795). SPECIAL PROJECT IN GEOGRAPHY
Readings, library, archival, and field work. Primarily for geography seniors. Prerequisite: permission of instructor. 2 or 4 cr.

797. SEMINAR IN GEOGRAPHY
Methodology and philosophy of geography. History of geographic thought, organizing concepts, and geographic analysis. Definition and investigation of research problems. Primarily for geography seniors. 4 cr. Cr/F.

Geology

(See Earth Sciences)

German and Russian

Chairperson: Michael J. Rosenbush

ASSOCIATE PROFESSORS: Marron C. Fort, Helmut F. Pfanner, Michael J. Rosenbush
ASSISTANT PROFESSORS: Alexander P. Danoff, emeritus; Roger S. Brown, James L. Sherman
LECTURER: Linda H. Scatton

German (GERM)

New students will be assigned to the proper course on the basis of their scores on the College Board Achievement test. Transfer credit will not be given for elementary-level college courses in foreign languages if the student has had two or more years of the foreign language in secondary school.

401-402. CONVERSATIONAL GERMAN
Aural and audio-visual methods. Previous knowledge of German not required. (No credit for students who have had two or more years of German in secondary school; however, any such student, whose study of this foreign language has been interrupted for a significant period of time, should consult the department chairperson about possibly receiving credit.) 4 lec/labs/4 cr.

403-404. SCIENTIFIC GERMAN
Reading in the natural and physical sciences. Emphasis on translation. Previous knowledge of German not required. (No credit for students who have had two or more years of German in secondary school; however, any such student, whose study of this foreign language has been interrupted for a significant period of time, should consult the department chairperson about possibly receiving credit.) 5 lec/4 cr.

407. ACCELERATED GERMAN
401-402 in one semester. Active use of the German language employing audio-visual techniques. Previous knowledge of German not required. (No credit for students who have had two or more years of German in secondary school; however, any such student, whose study of this foreign language has been interrupted for a significant period of time, should consult the department chairperson about possibly receiving credit.) 10 lec/labs/8 cr.

501. INTERMEDIATE GERMAN
Continuation and review of grammar, reading comprehension, and oral-aural practice. For students with high school German who wish to fulfill the Liberal Arts foreign language requirement and for students with reading knowledge background who need a transition to the oral-track method employed in Ger. 504. Instruction in German and English. 4 lec/labs/4 cr.

503-504. INTERMEDIATE GERMAN
A continuation of Ger. 401-402. Instruction in German. 4 lec/labs/4 cr.

525. INTRODUCTION TO GERMAN CULTURE AND CIVILIZATION
Homogeneous and heterogeneous aspects in the political, social, and cultural life of East Germany, West Germany, Austria, and Switzerland. Conducted in English. This course or its equivalent required of all German majors and strongly recommended for participants in the Salzburg Program. 4 cr.

526. INTRODUCTION TO GERMAN LITERATURE
Reading and analysis of poems, dramas, and short prose from the works of Goethe, Heine, Mann, Rilke, Kafka, Brecht, Frisch, Dürrenmatt, and others; introduction to theory of literary forms. Conducted in German. This course or its equivalent required of all German majors going on the Salzburg Program; prerequisite to upper-level literature courses. 4 cr.

530. GERMAN CONVERSATION
Dialogues in German concerning living and studying in Austria and Germany. Necessary for those participating in the Junior Year in Salzburg Program. Prerequisite: German 401-402 and 503 or equivalent. 2 cr.

601-602. ADVANCED LANGUAGE AND STYLE
Essential for all students intending to engage in study or research in a German-speaking country. Essays and oral reports. Required of all German majors; not open to students who will have taken the equivalent courses in Salzburg. 4 cr.

623. SURVEY OF PRECLASSICAL GERMAN LITERATURE
German literature from its beginning till the late 18th century. Prerequisite: Ger. 526. 4 cr.

624. THE AGE OF GOETHE
Major literary movements between 1770 and 1832. Reading and analysis of selected works. Prerequisite: Ger. 526. 4 cr.

625. GERMAN LITERATURE OF THE 19th CENTURY
Major literary movements from Goethe's death to the unification of Germany by Bismarck (1832-1872). Reading and analysis of selected works. Prerequisite: Ger. 526. 4 cr.

626. MODERN GERMAN LITERATURE
Major literary movements from 1872 to the present. Reading and analysis of selected works. Prerequisite: Ger. 526. 4 cr.

685-686. JUNIOR YEAR IN SALZBURG
A program of studies at the University of Salzburg (Austria) for students of colleges and universities in New England who have completed their sophomore year and have passed a minimum of four full courses in German with an average grade of B (3.0) or better and have an over-all grade average of C (2.5) Students are to take German 530, German Conversation (2 cr.) before going, and German majors are required to take German 526. Students participating are expected to attend a four-week, non credit orientation seminar in Salzburg prior to the beginning of the fall semester. Open to all students regardless of major. Interested students should consult the Director, Studies Abroad Program. Variable to 32 cr.

691, 692. ADVANCED STUDIES IN GERMAN
A special series of 2-credit courses to develop a knowledge of German language, culture, literature, e.g., 1) The Faust Legend; 2) Cultural Comparison of the U.S. and Germany; 3) Readings in Current Periodicals; 4) North Germany: Land and People; 5) German Mythology; 6) Modern Short Story; 7) Germany Tour. 2 cr.

693,694. MAJOR GERMAN AUTHORS IN ENGLISH
Critical reading of major works of one of the following authors. Conducted in English. (German majors read all works in original.) 1) Brecht; 2) Frisch and Dürrenmatt; 3) Other. Barring duplication of material, course may be repeated for credit. 4 cr.

726. GERMAN CULTURE AND CIVILIZATION
Historical, social, artistic, and folkloristic developments in German-speaking countries from the beginnings to the present. 4 cr.

781. HISTORY AND DEVELOPMENT OF THE GERMAN LANGUAGE
The changes in sounds, structure, and vocabulary from the earliest record to the present. Required for German majors. 4 cr.

791. METHODS OF FOREIGN LANGUAGE TEACHING—GERMAN
Interdepartmental course. Objectives, methods, and techniques in teaching Spanish, French, Latin, and German from elementary grades through college. Discussion, demonstration, preparation of instructional materials, micro-teaching of the language skills. Prerequisite: permission of instructor. (Same as French 791, Latin 791, and Spanish 791.) 4 cr.

797,798. SPECIAL STUDIES IN GERMAN CULTURE AND CIVILIZATION
Independent investigation; barring duplication of material, may be repeated for credit; presumes a sound background in Germanic studies. 1-4 cr.

Russian (RUSS)

New students will be assigned to the proper course on the basis of their scores on the College Board Achievement test. Transfer credit will not be given for elementary level college courses in foreign languages if the student has had two or more years of the foreign language in secondary school.

401-402. ELEMENTARY RUSSIAN
Oral-aural practice and written drills designed to achieve a mastery of basic grammatical patterns. Previous knowledge of Russian not required. (No credit for students who have had two or more years of Russian in secondary school; however, any such student, whose study of this foreign language has been interrupted for a significant period of time, should consult the department chairperson about possibly receiving credit.) 4 lec/labs/4 cr.

503-504. INTERMEDIATE RUSSIAN
Continuation of Russian 401-402. Review of Russian grammar, reading of prose, and practice in oral and written expression. Prerequisite: Ru. 402 or equivalent high school/college course with a grade of C or better. 4 lec/labs/4 cr.

505-506. RUSSIAN CONVERSATION AND PHONETICS
Designed to increase fluency in Russian conversation and improve phonetic articulation. Reflects contemporary Soviet speech and expressions. Prerequisite: Ru. 401-402 or permission of instructor. 2 lec/2 cr.

595,596. RUSSIAN TOPICS IN ENGLISH
A series to develop insight and knowledge of Russian culture e.g., 1) Russian Culture and Civilization; 2) Russian Arts: Music, Architecture, Painting, Folklore, Dress, Customs; 3) USSR Culture Tour; 4) Introduction to the Soviet Union: Peoples, Religions, Economy, Geography, Literature, Socio-Political Systems; 5) Social Trends in 19th Century Russian Literature; 6) Satire, Parody, Comedy in Russian Literature; 7) Russian Drama; 8) Soviet Literature; 9) Russian Short Story. 2 or 4 cr.

621. RUSSIAN MASTERPIECES IN ENGLISH
Russian literature of the last 150 years as represented by Pushkin, Gogol, Tolstoy, Dostoevsky, Solzhenitsyn. Readings, discussions, papers in English. 4 cr.

631-632. ADVANCED RUSSIAN CONVERSATION AND COMPOSITION
Advanced spoken and written Russian to maintain aural-oral fluency; advanced grammar. Individual conferences. Prerequisite: Ru. 503-504 or equivalent. 4 cr.

633 READINGS IN CURRENT SOVIET PERIODICALS
Advanced language practice in reading, speaking, and writing based on current events in Soviet newspaper and magazine articles. May be taken concurrently with 631-632 and repeated for credit. Prerequisite: Ru. 504 or equivalent. 4 cr.

691,692. ADVANCED STUDIES IN RUSSIAN
A special series of 2-credit courses on topics which develop a knowledge of Russian language, culture, and literature, e.g., 1) History of the Russian Language; 2) Structure of the Russian Language; 3) Readings in Russian Civilization; 4) Russian Poetry; 5) Russian Short Story; 6) Pushkin and Lermontov; 7) Gogol; 8) Turgenev; 9) Soviet Satire. 2 cr.

693,694. MAJOR RUSSIAN AUTHORS IN ENGLISH
Evolution of one of the authors listed below as artist, thinker, and social critic. Discussion and analysis of major fictional and doctrinal works. Readings, papers, and discussion in English. 1) Solzhenitsyn; 2) Dostoevsky; 3) Chekhov; 4) Tolstoy. Barring repetition of material, may be repeated for credit. 4 cr.

734. READINGS IN RUSSIAN LITERATURE
Reading and translation of selected works from Russian literature of the 19th and 20th centuries; samples of prose and poetry; problems of vocabulary building. Prerequisite: grade of C or better in Russian 504 or permission of instructor. 4 cr.

795,796. SPECIAL STUDIES IN RUSSIAN LANGUAGE AND LITERATURE
Selected topics in language, culture, and literature. Variable 1-4 cr.

Japanese

415-416. ELEMENTARY JAPANESE
Elements of Japanese grammar. Oral practice and written drills designed to achieve a mastery of basic grammatical patterns. Reading of graded exercises introducing the student to written Japanese (Hiragana and Katakana) and Chinese characters used in contemporary Japan. (No credit for students who have had two or more years of Japanese in secondary school; however, any such student, whose study of this foreign language has been interrupted for a significant period of time, should consult the department chairperson about possibly receiving credit.) 4 rec/lab/4 cr.

515-516. INTERMEDIATE JAPANESE
Review of Japanese grammar. Reading of prose and practice in oral and written expression. Emphasis upon contemporary Japanese. Prerequisite: permission of instructor or Jap. 416 with a grade of C or better. 4 rec / lab / 4 cr.

Greek

(See Spanish and Classics)

Health Studies (SHS)

Chairperson: David E. Berry

PROFESSOR: Basil J.F. Mott
ASSOCIATE PROFESSORS: David E. Berry, Edward R. Pierce
ADJUNCT ASSOCIATE PROFESSOR: Gerald Taube

400. HEALTH—HUMAN VALUES
Physiological, emotional, social and environmental factors affecting health. Basic health information to broaden understanding of health-related issues. Students examine their patterns of decision-making in issues directly affecting their lives. 4 cr.

401. INTRODUCTION TO HEALTH CARE SYSTEMS
Nature and functions of health care services and health professionals; impact of social, political, economic, legal, and technological forces. Current health problems. 2 lec/1 rec/4 cr.

402. PUBLIC HEALTH AND HUMAN ECOLOGY
Exploration of the health dimension of man's interaction with his physical and social environments and analysis of their problematic relationships; investigation of public health services at various levels of government. Prerequisite: permission of instructor. 4 cr.

(798a-k) 798a-k. SPECIAL TOPICS IN HEALTH STUDIES
Students may explore areas related to specific professional health interests. May repeat but not duplicate subject areas. a) Communication Disorders; b) Health Studies; c) Medical Technology; d) Nursing; e) Occupational Therapy; f) Physical Education; g) Recreation and Parks; h-k) Interdisciplinary. Prerequisite: permission of instructor. Variable 1-4 cr.

History (HIST)

Chairperson: Robert M. Mennel

PROFESSORS: Charles E. Clark, Hans Heilbronner, Charles A. Jellison, William R. Jones, David F. Long, Darrett B. Rutman, Douglas L. Wheeler, Donald J. Wilcox
ASSOCIATE PROFESSORS: Gibson R. Johnson, *emeritus*; Allan B. Partridge, *emeritus*; Robert C. Gilmore, Marion E. James. Allen B. Linden, Frank D. McCann, Robert M. Mennel, Marc L. Schwarz, John O. Voll
ASSISTANT PROFESSOR: Judith Silver

401 (401). PRESENT IN PERSPECTIVE
Selected issues in contemporary life. Modern religious, cultural, and political topics from the viewpoint of the historian in an effort to see the present in a broader perspective. Western and non-Western experiences. 4 cr.

Group I. American History

503,504. HISTORY OF THE UNITED STATES
American history from settlement to the present. Political, social, economic, and diplomatic aspects. 4 cr.

505,506. AFRO-AMERICAN HISTORY
Experiences, aspirations, and contributions of black Americans from their ethnic origins in Africa to the present American crisis in race relations. Includes comparative study of cultures and institutions. 4 cr.

510. U.S. HISTORY: INTRODUCTION
A topical survey, within broad chronological divisions, of the development of American civilization since 1600. Not open to students who elect His. 503 or 504. 4 cr.

703. THE COLONIAL PERIOD OF AMERICAN HISTORY
Interpretative and methodological approach to the development of an Anglo-American culture along the eastern seaboard of North America 1600-1750. 4 cr.

705,706. AMERICA IN THE 18th CENTURY AND THE REVOLUTION
American colonial and revolutionary history from 1740 through the adoption of the Constitution and the establishment of Washington's first administration. 4 cr.

711,712. 19th CENTURY AMERICA
Domestic and international factors in the development of the American Republic, its institutions and people, from the inception of the new nation in 1789 to the emergence of the United States as a world power in 1900. 4 cr.

715,716. 20th CENTURY AMERICA
United States history since 1896, from the triumph of industrialism on the national scene to the emergence of America as a world power in the nuclear age. Political, economic, and diplomatic developments. 4 cr.

719,720. THE FOREIGN RELATIONS OF THE UNITED STATES
Primarily the history of American diplomacy, with attention given to the non-diplomatic aspects. First semester: American Revolution to 1890; Second: 1890 to date. 4 cr.

721,722. HISTORY OF AMERICAN THOUGHT
Significant American thinkers considered in their social context. First semester: 1600 to 1860. Second semester: 1860 to the present. 4 cr. (Alternate years; offered 1976-77.)

724. AMERICAN URBAN HISTORY
The urbanization process from the Colonial period to the present. 4 cr.

Group II. European History

521. HISTORY OF SCIENCE (TO THE RENAISSANCE)
Prehistoric techniques, Pythagoreanism and Greek rationalism, the concept of the universe, neo-Platonism and the Newtonian synthesis, history of atomism. 4 cr.

522. HISTORY OF SCIENCE (POST RENAISSANCE)
The idea of the past, evolution; matter, energy, light; the rise and decline of classical physical science; history of relativity and the quantum theory. Prerequisite: His. 521 or permission of instructor. 4 cr.

535 (535). MODERN EUROPEAN HISTORY
The rise of Europe to global supremacy from the 14th to the 19th century, and its transformation in the 20th. 4 cr.

559,560. HISTORY OF GREAT BRITAIN
History of Great Britain from the earliest times to the present; from social, constitutional, economic, political, and intellectual perspectives. Designed for the history student as well as students interested in literature, western political and social systems, American studies, education, and pre-law. 4 cr.

739,740. THREE MEDIEVAL CIVILIZATIONS
The demise of classical antiquity in the lands bordering the Mediterranean and the genesis and fruition of three new cultural traditions: Latin, Christian, Islamic, and Byzantine. Religious, literary, and scholarly survivals and innovations from 400 A.D. to 1400 A.D. 4 cr.

741. THE AGE OF THE RENAISSANCE
The Renaissance from 1300 to 1600 stressing intellectual and cultural history and concentrating on events in Italy; aspects of northern Europe will also be covered. 4 cr.

742. THE AGE OF REFORMATION
Northern Europe from 1300 to 1600, stressing the intellectual and cultural aspects of the European Reformation. Concentrates on the 16th century but important trends in the 14th and 15th centuries will be given considerable attention. 4 cr.

747. 17th and 18th CENTURY FRANCE: THE OLD REGIME
How France changed from a society in which bonds were local to one in which noble and peasant alike identified with the State. 4 cr.

748. 19th CENTURY EUROPE: SOCIAL UPHEAVAL AND POLITICAL CHANGE
Tensions between social classes and their impact on protest and revolution. 4 cr.

751,752. EUROPEAN INTELLECTUAL HISTORY
The European intellectual tradition from the Greek philosophers to the end of World War II. How basic ideas have developed out of previous modes of thought in response to new challenges. 4 cr.

756. 20th CENTURY EUROPE
World War I, European totalitarianisms, World War II, the loss of European primacy, and the search for a new Europe. 4 cr.

(759). HISTORY OF MODERN SPAIN AND PORTUGAL
The Iberian states and their peoples from the coming of liberalism to the present. Failure of Iberian liberalism and liberal government. Political and social change, imperial and intellectual movements, influences of Western European thought and activity. 4 cr.

761,762. ENGLAND IN THE TUDOR AND STUART PERIODS
The political, religious, socio-economic, and intellectual forces for change at work in England from the accession of Henry VII to the Revolution of 1688-89. 4 cr.

763. RUSSIA: ORIGINS TO MODERNIZATION
Russia from its foundation to Emancipation and Reform. Political developments, foreign relations, intellectual and ideological currents. 4 cr.

764. RUSSIA: FROM TSARIST TO SOVIET EMPIRE
The cost of Modernization; Leninist and Stalinist revolutions; Soviet consolidation. 4 cr.

767,768. HISTORY OF GERMANY
From the Reformation to the Third Reich and the presently divided Germany. Emphasis on the relationship and importance of Germany to the rest of Europe. 4 cr.

771,772. MODERN ENGLAND
From 1760 to the present. Social, intellectual, economic, and political transformation of the country as it developed into a major industrial nation and then adjusted to international and economic difficulties in the 20th century. 4 cr.

774. HISTORIOGRAPHY
Analysis of ancient and modern historians. Required of all entering Ph.D. candidates, open to undergraduates with permission of the instructor. 4 cr. (Alternate years; offered 1977-78.)

Group III. Non-Western History

501 (501). WORLD HISTORY
Analysis of the major world civilizations, noting interrelationships in time and space among the different human societies. Social, cultural, and political factors of the human experience are examined. 4 cr.

531,532. LATIN-AMERICAN HISTORY
First semester: Amerindian America and the European conquest and domination down to the last half of the 18th century. Second semester: problems of identity, integration, and nationalism, with analysis directed at selected national areas (e.g., Brazil, Mexico, Argentina, and Cuba) plus attempts at generalization. 4 cr.

575. THE ANCIENT NEAR EAST
From the neolithic revolution to the time of Alexander the Great. The rise of civilization, the nature of man's artistic and intellectual development in the earliest civilizations of Mesopotamia and Egypt, and Judaism in its historical setting. 4 cr.

576. THE AEGEAN WORLD
A history of Greece and the Aegean area from Crete to the time of Alexander the Great in 323 B.C. 4 cr.

579,580. THE HISTORY OF CHINA AND JAPAN
Civilizations of China and Japan from their origins to the present. First semester: traditional civilizations of China and Japan to 1800. Second semester: the modernization of China and Japan after 1800. 4 cr.

585,586. THE HISTORY OF THE MIDDLE EAST
From the time of Muhammad to the present. First semester: origins and expansion of Islam and the nature of medieval islamic civilization. Second semester: Ottoman history, relations with European powers, and the emergence of modern nations in the Middle East. 4 cr.

587,588. HISTORY OF AFRICA SOUTH OF THE SAHARA
From ancient times to the present. First semester: from prehistoric times to 1870. Second semester: from 1870 to the present. African migrations, kingdoms and societies; African responses to the slave trade; Islam; European imperialism, colonialism, and industrialization; African nationalism, independence, and post-independence problems. 4 cr.

731. LATIN AMERICAN HISTORY: REGIONAL OR COUNTRY STUDIES
Seminar; readings and discussions of literature relative to region or country being studied. See department listing for the current semester's topic. Students will be guided through preparation of a research proposal. History 531-532 is recommended but not required. 4 cr.

732. LATIN AMERICAN HISTORY: TOPICAL STUDIES
Thematic seminar; readings and discussions of literature relative to selected topics. See the department listing for the current semester. Students will be guided through preparation of a research proposal. His. 531-532 is recommended but not required. 4 cr.

777,778. THE HELLENISTIC-ROMAN WORLD
The Mediterranean and the Near East from the death of Alexander the Great to the collapse of the Roman and Persian empires (5th to 7th centuries A.D.). Covers the main political and social developments of the area, but stresses artistic, scientific, philosophical, and religious trends, with particular emphasis on the rise of Christianity, Zoroastrianism, and the general religious climate that prepared the way for Islam. 4 cr.

(781). HISTORY OF MODERN CHINA, 1839—PRESENT
The modernization of China. The political, social, and cultural changes which have occurred in China from its early contacts with the West. 4 cr.

784. HISTORY OF SOUTHERN AFRICA SINCE 1820
The struggle for political and economic control in the only region of Africa where European groups remain in power. The impact of European imperialism, European settler nationalism, racial conflict, economic competition and industrialization, Apartheid, and Assimilation with special attention to the development of European hegemony. Official American policy. 4 cr.

(785). THE MODERN MIDDLE EAST
From the 18th century to the present time. The problems created by modernization and reform of the traditional society, the conservative reaction to reform, the impact of nationalism, and the appearance of new ideologies. 4 cr.

(787). BLACK CONSCIOUSNESS AND PROTEST
Origins and causes of the rising consciousness and consequent activism of the peoples of Negro descent in the New World and in Africa from the early 19th century to the present. Protest literature, black nationalism, Pan-Negroism, Pan-Africanism, negritude, the Nation of Islam, and separatist religious sects in the Americas and Africa. Cross-cultural and multi-disciplinary. 4 cr.

793. ADVANCED WORLD HISTORY
History from the perspective of the experience of the whole human community. The histories of separate areas in terms of their relationship to the general historical experience of man. Problems of interpretation, interrelationships, similarities, and differences in the development of the major traditions of civilization. Oral and written reports. 4 cr.

Group IV. Special Courses

595,596. EXPLORATIONS IN HISTORY
See department listings for semester topic. Variable 1-4 cr.

697 (697). COLLOQUIA FOR SENIOR HISTORY MAJORS
Intensive study of selected subjects in seminar or colloquium. Topics and instructor to be announced each year. Required and open only to history majors. Normally taken in senior year; juniors may be admitted with permission of the instructor. May not be repeated for credit except with permission of the department. Depending on the subject, may be used to satisfy major requirements in American, European, or non-Western history. 4 cr.

(775). HISTORICAL METHODS
Introduction to contemporary historical methods. Required of all entering Ph.D. candidates, open to undergraduates with permission of instructor. 4 cr. (Alternate years; offered 1976-77.)

(789). SEMINAR IN THE HISTORY OF SCIENCE
Selected topics conducted through special lectures, individual study, oral and written reports. Subject varies. Cannot be used for credit in history without permission of the department. Prerequisite: permission of adviser and instructor. 4 cr.

790. QUANTIFICATION AND COMPUTERS FOR THE HISTORIAN
The historian's use of computers and statistics, practical applications of both interactive terminal operations and batch processing. Data generation and processing, computer languages (BASIC, FORTRAN), programming and library programs, elementary statistics; students will undertake operations of their own on material supplied and will consider particular quantitative studies in history in terms of techniques used. No previous knowledge of computers or college mathematics required. Prerequisite: admission as an undergraduate major or graduate student in history, or permission of instructor. 4 cr.

795, 796. INDEPENDENT STUDY
1) Early American History, 2) American National History, 3) Canada, 4) Latin America, 5) Medieval History, 6) Early Modern Europe, 7) Modern European History, 8) Ancient, 9) Far East and India, 10) Near East and Africa, 11) European Historiography, 12) American Historiography, 13) Russia, 14) World History, 15) British History. For students showing a special aptitude in history who desire to study an area or subject for which no appropriate course is offered. Prerequisite: permission of major adviser and a faculty superviser. 4 or 8 cr.

797 (797). COLLOQUIA IN HISTORY
Selected topics in American, European, and non-Western history. Open to advanced undergraduate and graduate students. Prerequisite: permission of instructor. Depending on the particular subject, may be used to satisfy the major requirements in American, European, or non-Western history. 4 cr.

Home Economics (HEC)

Chairperson: Elizabeth A. Snell

ASSOCIATE PROFESSORS: M. Elizabeth Rand, emerita; Mary E. Holder, Elizabeth A. Snell
ASSISTANT PROFESSORS: Larry J. Hansen, Victor R. Messier
INSTRUCTORS: Judith A. Dawson, Mary T. Larson, Linda Schomaker, Rennae C. Sletten
LECTURERS: Frances P. Grainger, Florence L. Hansen

407. PROFESSIONAL SEMINAR
Definition and clarification of professional and educational objectives in Home Economics. 2 cr. Cr/F.

415 (415). BASIC CLOTHING CONSTRUCTION
Self-paced programmed instruction laboratory. Experimental approaches to clothing construction. 2 cr. Cr./F.

(418) 418. FOOD PREPARATION
Principles of food preparation and service; meal planning. Application of principles through laboratory. Prerequisite: H.E. major. Laboratory fee $10. 2 cr.

419. MEAL MANAGEMENT
Planning, selection, and serving; management of time, money, and energy. Prerequisite: H.E. major. Lab fee $5. 2 cr.

506. PRINCIPLES OF NUTRITION
Fundamental principles underlying the nutrition of man and animals; functions of the various nutrients in the maintenance, growth, and production of the animal body and the metabolic disorders resulting from their deficiency; the digestion, absorption, intermediary metabolism, and excretion of individual nutrients will be discussed within this framework. Prerequisite: Human Physiology and some knowledge of organic chemistry. Mr. Repka. (Also offered as Animal Science 506.) 3 lec/1 lab/4 cr.

507 (507). INTRODUCTORY FIELD EXPERIENCE
Supervised community experience; opportunity to explore career opportunities in nursery schools, day care centers, cooperative extension, programs for the handicapped, youth groups, schools, community and family welfare agencies, hospitals, and others. Prerequisite: H.E. major and permission of instructor. May be repeated. 2 or 4 cr.

(514) 514. TEXTILES
Textile fiber and fabric properties, producer-retailer-consumer interrelationships, the textile industry. Laboratory work with textile fibers and fabrics. 4 cr.

525 (525). HUMAN DEVELOPMENT
Development and guidance from conception through aging. Specific observation project required. 4 cr.

527. GUIDING CHILDREN
Current theoretical approaches to communicating with children and influencing their behavior. Weekly 2-hour working session with preschool children in a laboratory setting; weekly 2-hour seminar. Prerequisite: H.E. 525. 2 cr.

(531). HOUSING AND DESIGN
Housing examined in terms of design, physical, socio-psychological, and community needs. 4 cr.

557 (557). CONSUMER EDUCATION
Role and responsibility of the consumer in the marketplace including consumer decision-making. Protective role of government as it relates to the consumer is also studied. 4 cr.

573 (573). HUMAN NUTRITION
Principles of nutrition and application to life. 4 cr.

575. NORMAL AND THERAPEUTIC NUTRITION
Principles of nutrition and application to health during the life cycle; dietary treatment of some diseases. 4 cr.

583. THE YOUNG ADULT
Effects of experience on identity formation in normal development of adolescent to adulthood. 4 cr.

607 (607). PROFESSIONAL SEMINAR
Philosophy, focus and issues in home economics. Professional opportunities; role of home economist as an educator. 2 cr. Cr./F.

615. SPECIALIZED CLOTHING CONSTRUCTION
Methods, processes, and techniques in pattern designing; advanced clothing construction. Laboratory: application and experimentation. Prerequisite: H.E. 415, exemption test, or permission of instructor. 4 cr.

(626) 626. THE YOUNG CHILD
Research concerning normal development during infancy and early childhood. Student will design and conduct an individual study with young children. Prerequisite: H.E. 525 or equivalent. 4 cr.

627 (627). PRESCHOOL METHODS AND MATERIALS
Learnings appropriate for young children; methods and materials for encouraging these learnings in a developmentally sound manner. Prerequisite: H.E. 525 and permission of instructor. 4 cr.

657 (657). MANAGEMENT AND DECISION MAKING IN THE FAMILY
Management concepts including decision making applied to families. 4 cr.

671. INTRODUCTION TO FOOD SCIENCE
Experimental study of food; application of principles underlying food preparation; experimentation in comparative food preparation. Prerequisite: H.E. 418 or equivalent and some knowledge of organic chemistry. Laboratory fee $8. 4 cr.

674. QUANTITY FOOD PURCHASING AND PRODUCTION
Principles and methods; lab experiences in University dining halls. Prerequisite: basic food preparation and permission of instructor. 4 cr.

683 (683). FAMILY RELATIONS
Theories and supporting research; dynamics and patterns of interaction, role behavior, and development in families. Prerequisite: course in behavioral sciences. 4 cr.

685. ONE SEMESTER AT THE MERRILL-PALMER INSTITUTE
Junior or senior majors in H.E. may attend the Merrill-Palmer Institute in Detroit, Michigan, for one year or one semester.

695 (695). INDEPENDENT STUDY
Students with special ability in a selected area of home economics may work on a problem of special concern. Regular conferences with an adviser are required. Prerequisite: department permission. May be repeated. 2 or 4 cr.

(696) 696. FIELD EXPERIENCE
Work with an agency, institution, or organization concerned with the welfare of families and individuals. Student will plan with department adviser and apply for approval. Student will live in or near the community in which s/he is working and will pay regular University tuition. Prerequisite: approval of faculty members and limited to H.E. juniors and seniors. Variable to 16 cr.

707. PRACTICUM IN HOME ECONOMICS
Supervised in-depth experience with observation and participation to increase the student's understanding in a specific area of Home Economics. Choice of practicum from 1.) child; 2.) family; 3.) consumer; 4.) food and nutrition. Prerequisite: H.E. major and permission of instructor. 4 cr.

709. BIOCHEMISTRY OF NUTRITION
Intermediary metabolism of nutrients and energy; metabolism transport mechanisms; biological oxidations; interrelationships of carbohydrate, fat, and protein metabolism; obesity; control of hunger and appetite. Prerequisite: college course in biochemistry. (Also offered as Animal Science 709.) 3 lec/4 cr.

(715). CLOTHING IN RELATION TO HUMAN BEHAVIOR
Research and theory in the social psychological aspects of clothing; clothing behavior of individuals and groups; stages of the life cycle, development of the self, and the phenomenon of fashion. 4 cr.

725 (725). PRESCHOOL PROGRAMS
Organization of time, space, materials, and people for the purpose of attaining goals in preschool education. Historical and current programs will be studied. Prerequisite: H.E. 627 or permission of instructor. 4 cr.

727. STUDENT TEACHING IN PRESCHOOL
Supervised teaching experience. Students spend five half-days a week in a selected preschool working with a cooperating teacher. Weekly seminar on campus. Prerequisite: H.E. major and 525, 527, 626, 627; and permission of instructor. 6 cr.

754. PERSONAL AND FAMILY FINANCE
Financial alternatives available to individuals and families during stages of the family life cycle. 4 cr.

757. CONSUMER PROBLEMS
Consumer problems analyzed from the perspective of family, business, and government interests. Prerequisite: 8 credits in consumer studies and permission of instructor. 4 cr.

774. CLINICAL DIETETICS
Principles of normal nutrition applied to clinical problems; altered nutrient requirements in human disease. Diet therapy as applied to clinical nutrition. Prerequisite: H.E. 573 and 506, a college course in biochemistry, and consent of the instructor. 3 lec/1 lab/4 cr.

(776). CONTEMPORARY ISSUES IN NUTRITION
Focus on national and world-wide nutrition concerns. Approaches and materials used in nutrition education. Prerequisite:H.E. 573 or 575, permission of instructor. 4 cr.

(786). DYNAMICS OF FAMILY CHANGE
Theories and research for the assessment of family interaction patterns; planned intervention techniques. Students examine their interaction processes and their possible effect on intervention efforts. Prerequisite: H.E. 683, Psychology 561. 4 cr.

791 (791). METHODS OF TEACHING HOME ECONOMICS
Home Economics in the school program; curriculum materials, methods, and resources in teaching. 4 cr.

793. FAMILY LIFE EDUCATION
A critical review of current issues and literature; materials and methods for programs such as sex education and parent education. Prerequisite: Bio. 409, H.E. 683, and permission of instructor. 4 cr.

Hotel Administration (HOTL)

Program Director: Mel Sandler

ASSOCIATE PROFESSOR: Mel Sandler
INSTRUCTORS: Eric Orkin, Niel Porta
ADJUNCT FACULTY: Barry Kaplan, James McFate, Leonard Rochette

403 (403). ELEMENTS OF INSTITUTIONAL ADMINISTRATION
Description of food service and lodging industries and introduction to foods and food production, including laboratory and practical management and production experience. 4 cr.

518. FINANCIAL ANALYSIS AND CONTROLS
Unique controllership of lodging and of food service industries; budgeting, controls, and systems. Prerequisite: Admin. 571. 4 cr.

556. MANAGEMENT OF PHYSICAL STRUCTURES
Physical components of structures are examined re: concepts, design, planning, construction, equipment selection, maintenance, and costs. 4 cr.

655. MANAGEMENT FOR TRANSIENT, LEISURE, AND INSTITUTIONAL SERVICES
Feasibility planning, development, financing, and organization of facilities. Examination of major functional departments and their interdependence; analysis of fixed and variable costs of each department. Work observation periods in industry. Prerequisite: Hotel Admin. 518. 4 cr.

(666) 666. MARKETS AND PROMOTION OF PUBLIC SERVICES
Identification and analysis of markets and competition. Advertising and promotion for increased activity in all industry profit centers. Participation in industry marketing program development and sales campaigns. Senior standing. Prerequisite: Admin. 651. 4 cr.

667 (667). FUNCTIONAL MANAGEMENT
Role of the manager in planning, organizing, controlling, and evaluation of an operation. Includes performance of large scale dinner. Senior standing. 4 cr.

695. INDEPENDENT ANALYSIS
Study and research project for honor students to advance knowledge in lodging and food services fields. Prerequisite: senior standing and permission of instructor. 4 cr.

(698) 698. SEMINAR
Special topics and developments in lodging and food services industries. Senior standing and permission of instructor. (Class may be limited to 20.) 4 cr.

Humanities (HUMA)

401 (401). INTRODUCTION TO THE HUMANITIES
Interdisciplinary study of creative arts and living ideas. For freshmen with little or no previous exposure to humanities. Multisection course on different topics. Three sections must be passed to receive credit. Sections divided into three categories: 1) practical aspects of the creative process, 2) ideas which have influenced man from ancient to modern times 3) area studies. Cultural events included when appropriate. May be repeated for credit if different sections are taken. 4 cr.

501. HUMANITIES OF THE ANCIENT WORLD
Appreciation of literature, the arts, and philosophy. Roots of Western civilization: Homer, Greek tragedy, Plato, Aristotle, the Bible, Virgil. Weekly lecture series, slides, films, visit to Boston museums. 4 cr.

502. HUMANITIES OF THE MODERN WORLD
Literature, philosophy, and art from Dante through the French and Russian realists. Dante, Castiglione, Machiavelli, Montaigne, Racine, Moliere, Pope, Goethe, Wordsworth, Zola, Tolstoy. Weekly lecture series, slides, films, visit to Boston museums. 4 cr.

503. HUMANITIES OF THE 20th CENTURY
Literature, philosophies, and art of Western civilization in the last hundred years. Prerequisite: Hum. 502 or course in history of literature, philosophy, or the arts. 4 cr.

595. SPECIAL STUDIES IN THE HUMANITIES
Selected topics not covered by existing courses, with subjects to vary. May be repeated for credit. 2 or 4 cr.

699. SENIOR PROJECT IN HUMANITIES
Independent study open only to senior Humanities majors, with individual project approved and supervised by faculty. 2-6 cr.

Institute of Natural and Environmental Resources

Director: David P. Olson

PROFESSORS: Richard A. Andrews, James P. Barrett, James R. Bowring, Paul E. Bruns, Gordon L. Byers, William H. Drew, Owen B. Durgin, Nicholas Engalichev, Francis R. Hall, William F. Henry, John L. Hill, Harold W. Hocker, Jr., Allan B. Prince
ASSOCIATE PROFESSORS: Bennett B. Foster, Robert D. Harter, Edmund F. Jansen, William W. Mautz, David P. Olson, Nobel K. Peterson, M. Marcel Reeves, Oliver P. Wallace, Sillas B. Weeks, Richard R. Weyrick
ASSISTANT PROFESSORS: W. Thomas Adams, John E. Carroll, S. Lawrence Dingman, H. Stevan Logsdon, Roger P. Sloan
ADJUNCT PROFESSORS: George E. Frick, Nelson L. LeRay
ADJUNCT ASSOCIATE PROFESSORS: C. Anthony Federer, William B. Leak, Robert S. Pierce
ADJUNCT ASSISTANT PROFESSORS: Peter W. Garrett, Douglas E. Morris

Institute of Natural and Environmental Resources (INER)

401. NATURAL AND HUMAN RESOURCES OF NEW ENGLAND
Historical and present population and settlement patterns, potential demographic patterns; changing socio-economic, political, and cultural patterns; transportation characteristics; changing resource foundation: soils, minerals, water, air, forests, wildlife, fisheries, parks, critical natural environments, and aesthetic amenities. Outside speakers. Mr. Carroll. 2 cr.

511. COMPUTATION METHODS IN NATURAL RESOURCES
Computer programming using BASIC on remote terminals to solve forestry and other natural resource problems. No credit if Math 403 is taken. Mr. Foster. 1 lec/1 lab/2 cr.

528. APPLIED STATISTICS I
Development of elementary statistical techniques through the analysis of prepared data. Continuous and discreet probability distributions; distributions of sample statistics; small-sample theory; regression; correlation; non-parametrics. No credit for upper division undergraduates or graduate students. See INER 701. Mr. Durgin, 4 cr.

581. METHODS IN LAND SURVEYING
Principles and field methods of land surveying for the natural resource manager; measurement of distance, direction, and elevation; instrumentation and computation; legal aspects of land description and boundary. Prerequisite: Forest Resources 542 or permission of instructor. Mr. Jenkins. 2 lec/1 4-hour lab/4 cr.

603, 605. ENVIRONMENTS OF NEW HAMPSHIRE
Societal and ecological modifications of N.H. environments from seacoast to alpine tundra, including the physical, biological, economic, and societal modifications of each system. Prerequisite: a basic course in biology and economics, or permission of instructor. Summers only. 3 cr.

604, 606. ENVIRONMENTS OF NEW HAMPSHIRE LAB
Techniques in collection and maintaining plant, animal, and geologic specimens; demonstrations on the ecologic and environmental systems; use of audio-visual aids to learn the systems; and field observation and collection. Transportation fee. 2 cr.

609, 610. SEMINAR
Seminars arranged according to student needs: 1) Community Development; 2) Forestry; 3) Hydrology; 4) Resource Economics; 5) Soils; 6) Wildlife; 7) Fire Ecology; 8) Environmental Conservation; 9) Coastal Zone Management. Staff. Variable 1-2 cr.

611. COASTAL RESOURCE MANAGEMENT
Systematic and regional analysis of the environmental problems caused by man's use and misuse of the coastal zone (estuaries, wetlands, saltmarsh, beaches); alteration, destruction, and polution of these environments. Some emphasis on coast and shoreline of the Northeast with fieldwork. Mr. Carroll. 4 cr.

615. LINEAR PROGRAMMING METHODS
Setting up and solving problems by the simplex and distribution methods; variation in linear programming methods with applications; non-linear programming, discrete programming; and solving input-output and game-theory problems. Applications to firm and aggregate economic analysis. Prerequisite: Elementary Matrix Algebra or permission of instructor. 3 credits.

635 (635). CONTEMPORARY CONSERVATION ISSUES
How man's technology causes biological and social conflicts when applied to wild-land resources; multiple demands of game, timber, water, minerals, and soil ecosystems vs. economic growth. Elective for all students except freshmen. Mr. Wallace, Mr. Carroll. 3 lec/4 cr.

637. PRACTICUM IN ENVIRONMENTAL CONSERVATION
Independent participation in an environmental conservation activity to help people understand and improve environmental quality. Students plan, present, and discuss their activities. Individual or group projects may be developed with any faculty member within or outside INER. Research projects are not acceptable. Prerequisite: senior standing. Staff. 1 lec/1 lab/4 cr.

701 (701). STATISTICAL METHODS I
Analysis of variance and general linear models; measured numbers, the nature of statistical evidence, sampling distributions, and principles of statistical inference; application of specific linear models to given sets of data. Prerequisite: upper-division undergraduate or graduate standing. Mr. Durgin. 4 cr.

702. NATURAL RESOURCES POLICY
Contemporary issues in the management and allocation of natural resources; impact of man on agricultural and forest lands, water, wildlife, fisheries, and minerals; historical perspective of current resource policies. Prerequisite: permission of instructor. Mr. Bruns. 4 cr.

709. SOILS AND COMMUNITY PLANNING
Using a town plan and soils map, students develop reports for multiple urban and rural land-use—housing, sewage, recreation, transportation, runoff, etc. USDA soil classification system; Soil Conservation Service rating criteria; N.H. soils. Guest lecturers. Prerequisite: permission of instructor. Mr. Peterson. 2 lec / 2 cr.

711. STATISTICAL METHODS II
Intermediate course in statistics; basic concepts of sampling, linear models and analyses for one-way and multiway classification, factorial arrangement of treatments, multiple regression, and covariance. Computer programs used in analyzing data. Examples taken from environmental sciences. Prerequisite: INER 528 or equivalent. Mr. Barrett. 4 cr.

712. SAMPLING TECHNIQUES
The techniques of sampling finite populations in environmental sciences; choice of sampling unit and frame, estimation of sample size, confidence limits, and comparisons of sample designs. Prerequisite: INER 528 or equivalent. Mr. Barrett. 2-4 cr.

714. QUANTITATIVE ECOLOGY
Applied quantitative techniques: basic concepts in probability and statistics applied to ecological systems, population dynamics, spatial patterns, species and abundance and diversity, classification and ordination, production, and energy and nutrient flow. Additional credit for in-depth mathematical analysis of a particular topic. Prerequisite: introductory courses in calculus, statistics, and ecology. Mr. Barrett. 3 or 4 cr.

718. LAW OF NATURAL RESOURCES AND ENVIRONMENT
For resource managers: the legal system pertaining to resource management, protection of the environment, and possibilities for future action. Prerequisite: INER 635 or Res. Econ. 606 or permission of instructor. Mr. Tucker. 3 cr.

735. POLLUTION OF WATER: CAUSES AND CONTROL
Problems in environmental pollution; scientific and technological aspects of pollution and pollution control; sources, effects, and control of water pollution, and its social, economic, and legal implications. Prerequisite: senior or graduate standing. Mr. Harter. 2 lec and weekly papers / 4 cr.

757. BASICS OF REMOTE SENSING
Fundamentals for application of photographic and non-photographic sensors to information gathering in natural resource fields; emphasis is on the interpretation of aerial photographs. Applications to forestry, wildlife, land-use planning, earth sciences, soils, hydrology, and engineering. Transportation fee. Mr. Bruns. 1-hr lec/2 hr lab/2 cr.

758. APPLICATIONS OF REMOTE SENSING
Applications of remote sensing to the student's disciplinary interest. Student project is developed using available conventional aerial photography or other imagery. Transportation fee. Prerequisite: INER 757 or equivalent. Mr. Bruns. 1-hr lec / 2-hr lab / 2 cr.

797. FOREST RECREATION SEMINAR
Recreational use of non-urban lands; economics of public and private developments; planning for state and private recreational use, social aspects. Class project. Prerequisite: junior standing and permission of instructor. Mr. Wallace. Two 1-½ hour sessions/4 cr.

Forest Resources (FORS)

425. DENDROLOGY
Identification, classification, and silvical characteristics of trees and shrubs in autumn and winter; plant taxonomy, ecological succession, and plant geography; North American forest regions. Required of freshmen in forestry and wildlife. Transportation fee. Mr. Adams. 2 lec/1 lab/4 cr.

426. WOOD SCIENCE AND TECHNOLOGY
Microstructure; physical, chemical, and mechanical properties; seasoning and preservation of wood; identification of commercially important timbers; log and lumber grading; sawmill volume and grade yield study. Transportation fee. Mr. Hill. 2 lec/2 lab/4 cr.

527. SILVICS
The ecological base of silviculture, classification of forest communities, environmental factors and their influence on forest vegetation. influence of vegetation on environment. Transportation fee. Prerequisite: Bot. 411, F.R. 425 or Bot. 566, SWS 501 taken concurrently. Mr. Hocker. 3 lec / 1 lab / 4 cr.

542. FORESTLAND MEASUREMENT AND MAPPING
Elementary measuring equipment and techniques; preparation of maps; public land survey; courthouse deed search. Two-week field session following the close of spring semester. Transportation fee. Mr. Foster, Mr. Weyrick. 2 cr.

544. FOREST ECONOMICS
Supply and demand for forest products and services; forestry and the general economy; economics of the firm; forest evaluation; taxation. Prerequisite: a course in principles of economics. Mr. Foster. 3 lec/1 lab/4 cr.

629. SILVICULTURE
Application of ecological knowledge to the control, establishment, composition, and growth of forest stands for economic purposes. Transportation fee. Prerequisite: F.R. 425 and 527. Mr. Hocker. 2 lec/2 lab/4 cr.

630. FOREST HARVESTING, SILVICULTURE, AND MANAGEMENT
Sec. 1: harvesting and silviculture activities. Prerequisite: F.R. 629 and permission of instructor. Sec. 2: extended field trip to another forest region. Prerequisite: senior standing, F.R. 745 and permission of instructor. Mr. Hocker. Limited enrollment. 1-2 cr. Cr/F.

634. WILDLIFE ECOLOGY
Principles and factors affecting wildlife populations, including wildlife and fish management, population dynamics, identification, census methods, habitat requirements. A research project is required. Prerequisite: A basic course in biology, botany, zoology, or consent of instructor. Transportation fee. Mr. Logsdon. 2 lec/rec/ lab/4 cr.

644. FOREST MENSURATION
Mathematical, statistical, and computer techniques in forest resource measurements and inventory; area sampling, point sampling, and photogrammetric techniques. Transportation fee. Prerequisite: calculus, computer techniques, and F.R. 542. Mr. Barrett. 3 lec / 1 lab / 4 cr.

660. FOREST FIRE PROTECTION
Forest fire prevention, behavior, and effective control; weather phenomena; other aspects of forest damage; fire effects and use. Transportation fee. Prerequisite: F.R. 527 or 629, S & W Sci. 501. Mr. Weyrick. 2 lec / 1 lab (10 weeks of semester) / 2 cr.

672. ECOLOGICAL ENERGETICS
Flow of energy through ecological systems; thermodynamics in biological systems; photosynthesis; respiration, trophic structure; productivity; ecological efficiency; man's use of energy, present and future, and his effects on energy flow in the ecosystem. Prerequisite: an ecology course or permission of instructor. Mr. Mautz. 4 cr.

695, 696. INVESTIGATIONS IN FORESTRY
1) Forest Ecology; 2) Photogrammetry; 3) Forest Utilization; 4) Game Management; 5) Mensuration; 6) Forest Economics; 7) Forest Management; 8) Operations Control and Analysis; 9) Recreation; 10) Policy; 11) Wildlife Physiology. Prerequisite: permission of instructor. Hours arranged. Variable 1-4 cr.

720. FOREST GENETICS
The genetics of forest tree improvement; variation in natural populations, evolutionary principles, and breeding methods. Prerequisite: Pl. Sci. 604 (Zool. 604) and F.R. 629, or permission of instructor. Mr. Adams. 2 lec / 1 lab / 3 cr. (Alternate years, offered 1976-1977.)

722. ADVANCED SILVICULTURE
Intensive silviculture of forest stands. Artificial regeneration (e.g., alternative regeneration methods and site preparation); plantation management (e.g., thinning schedules and fertilization). Prerequisite: F.R. 629 or equivalent and permission of the instructor. Mr. Adams and Mr. Hocker. 4 cr.

734. FOREST PROTECTION SEMINAR
Discussion and special problems based on principles and techniques of forest protection. Prerequisite: F.R. 660 or courses in entomology or plant pathology. 3 cr.

737. GAME MANAGEMENT I
Biological characteristics, habitat requirements, research and management practices of upland game birds and big game animals. Several all-day field trips required (possibly on weekends) to New England wildlife areas. Transportation fee. Prerequisite: wildlife management major or permission of instructor. Staff. 2 lec/1 rec/1 lab/4 cr.

738. GAME MANAGEMENT II
Biological characteristics, habitat requirements, research and management practices of small game animals, furbearers, predators, and waterfowl. Several all-day field trips required, (possibly on weekends) to New England wildlife areas. Transportation fee. Prerequisite: wildlife management major or permission of instructor. Staff. 2 lec/1 rec/1 lab/4 cr.

745. FOREST MANAGEMENT
Production control; management objectives; forest production regulation and economic analysis; forest administration; professional responsibilities and opportunities. Prerequisite: completion of junior year in forestry curriculum. Transportation fee. Mr. Weyrick. 3 lec/1lab/4 cr.

753. OPERATIONS CONTROL AND ANALYSIS
Some quantitative tools for decision-making in forest resource management activities; development and analysis of cost functions, timber and stumpage valuation, forecasting, linear programming. Monte Carlo simulation, PERT, Mr. Foster. 2 lec / 1 lab / 4 cr.

754. WOOD PRODUCTS MANUFACTURE AND MARKETING
Wood products from harvesting and procurement of raw material to finished product processes; management decisions, marketing, and promotion problems. Visits to harvesting operations and manufacturing plants in New England. Transportation fee. Prerequisite: F.R. 426, or permission of instructor. Mr. Hill. 2 lec / 1 lab / 4 cr.

764. FOREST INDUSTRY ECONOMICS
Business methods and economics in the forest industry; planning for minimum cost operations and profitable use of capital in a forest enterprise. Individual projects. Prerequisite: senior standing and permission of instructor. Mr. Wallace. 4 cr.

798. FOREST RESOURCES MANAGEMENT SEMINAR
Population trends and human needs in relation to forest land productivity for timber, wildlife, water, recreation, and grazing. Class organized for group planning to maximize forest productivity for the state of New Hampshire. Prerequisite: F.R. 745. Mr. Wallace. 2 lec/1 lab/4 cr.

Resource Economics (RECO)

411 (411). INTRODUCTION TO RESOURCE ECONOMICS
Organization and operation of the American economic system; role that resource-use plays within that system. Essential elements of macroeconomic principles; institutions and programs affecting resource use and the impact on environmental quality. Principles dealing with the economic operation of individual consumption or production units within the framework of supply, demand, price, and the economic principles of marginality. Major subject-matter fields of resource economics are reviewed. Staff. No credit if Econ. 402 or Res. Econ. 402 has been taken. 4 cr.

501. AGRICULTURAL AND NATURAL RESOURCE PRODUCT MARKETING
Structure, organization, and performance of the business section in agriculture, forestry, and other local natural resource based industries; commodity marketing systems; demand estimation, pricing policies, consumer characteristics, and related topics. Prerequisite: Res. Econ. 411 or equivalent or permission of instructor. Mr. Andrews. 4 cr.

504. MANAGEMENT OF FARM AND RELATED RESOURCE-BASED BUSINESS
Planning, operation, and control of the farm with emphasis on application for the commercial farmer. Prerequisite: Res. Econ. 402, 411, or permission of instructor. Mr. Weldon. 2 lec/1lab/4 cr.

506. POPULATION, FOOD, AND RESOURCE USE IN DEVELOPING COUNTRIES
The economic, technical, cultural, social, and political factors that influence food supplies, nutrition resource use, employment, and income distribution in the developing countries; the population explosion; strategies for expanding food supplies; social and institutional constraints; strategies and policies for economic development. Mr. Jansen. 3 lec/4 cr.

507. INTRODUCTION TO COMMUNITY DEVELOPMENT
Principles and methods of community development; skills required to help people enhance the social and economic well-being of their communities. Institutional structures; change processes; citizen participation in decision-making; and problem analysis in contemporary, nonmetropolitan communities in New England. Mr. Jansen. 2 lec/1 lab/4 cr.

508. APPLIED COMMUNITY DEVELOPMENT
Students work in an actual community, assisting individuals and groups to identify needs and problems, establish attainable and objective goals, assess requirements and resources, and formulate programs for development; methods of collection, analysis and integration of pertinent primary and secondary economic, social, political, and physical data for community development. Prerequisite: Res. Econ. 507 or permission of instructor. Mr. Weeks. lec/lab/4 cr.

606. LAND ECONOMICS AND USE
Economic and institutional factors affecting man's use of land resources; historical discussion of land ownership patterns; supply and demand; production relationships; location and resource use; benefit-cost analysis; institutional restraints and planning for more efficient use of land; the real estate market and taxation. Staff. 4 cr.

612. MARINE RESOURCE ECONOMICS
Economic overview of the marine environment; interactions/conflicts surrounding this multiple-use resource. Economics of fisheries; marine recreation; offshore facilities; aquaculture; waste disposal. Prerequisite: Res. Econ. 411 or Econ. 402 or permission of instructor. Staff. 3 lec/4 cr.

676. ECONOMICS OF WATER USE AND QUALITY MANAGEMENT
Economics of water use; role of government and policy agencies, water supply and demand, economic impact of water and water quality standards, alternatives in quality management, externalities, and methods of evaluation. Prerequisite: elementary biological or physical science (or Soil and Water 504) and elementary economics. Mr. Andrews. 4 cr.

705. PLANNED CHANGE IN NON-URBAN COMMUNITIES—APPLICATION
Application of community development theory and principles using appropriate research methodologies. Students participate in community-development activities, and discuss problems and report on experience and progress in weekly seminars. May include placement in field agency. Prerequisite: Res. Econ. 508 or permission of instructor. Mr. LeRay. 4 cr.

706. ECONOMICS OF RESOURCE DEVELOPMENT
Resource scarcity and theories of economic development; the major resource development problems of land and natural resources, urban-rural conflicting demands, and conservation and water supply; capital needs, externalities, and market failure. Prerequisite: intermediate economic theory. Mr. Jansen. 4 cr. (Alternate years; offered 1977-78.)

707. RESEARCH METHODS IN SOCIAL SCIENCE
Scientific method; analysis of problems; design and application of research techniques. Can be used in place of Soc. 702. Prerequisite: three hours of statistics. Mr. Drew. 4 cr.

717. LAW OF COMMUNITY PLANNING
Common law and the Constitution with respect to property law including eminent domain, land-use planning, urban renewal, and zoning. Makes the non-lawyer aware of the influence and operation of the legal system in community development. Mr. Tucker. 4 cr.

756. REGIONAL ECONOMIC ANALYSIS
Concepts and methods of delimiting regional economies, theories of growth, methods of measuring activity, regional development, and public policies. Emphasis on empirical research studies. Prerequisite: intermediate economic theory, elementary statistics, calculus, linear programming, or permission of instructor. Staff. 4 cr.

795/796. INVESTIGATIONS IN RESOURCE ECONOMICS
Special assignments in readings, investigations, or field problems. May be repeated. 1) Community Development; 2) Economic Development Programs; 3) Economics of Natural Resources; 4) Human Resource Development; 5) Legal Problems of Resource Development; 6) Natural Resources Policy; 7) Production and Marketing of Agricultural Products; 8) Public Resource Policy; Resources Investment Policy; 10) Water Economics. Prerequisite: permission of instructor. 2 to 4 cr.

Soil and Water Science (S WS)

Hydrology

504. FRESH WATER RESOURCES
Major determinants of fresh water resources including: hydrologic cycle and water balance; precipitation; stream-flow measurement; pollution; water supply and sewage treatment; water resource development Mr. Byers. 3 lec/1 lab/4 cr.

601. CHEMICAL ANALYSIS OF WATER
Methods of water chemical analysis. Prerequisite: permission of instructor. Mr. Hall. 1 lec/1 lab/2 cr.

603. SOIL AND WATER ENGINEERING
Engineering principles and the control of water; precipitation and stream-flow measurement, hydrograph development, estimating run-off from a watershed, and the design of structures to control this run-off. Instrumentation and problem analysis. Mr. Byers. 3 lec / 1 lab / 4 cr.

705. PRINCIPLES OF HYDROLOGY
Physical and chemical processes and energy relations involved in the rainfall-runoff segment of the hydrologic cycle; surface outflow from a watershed with consideration given to sediment transport and water quality. Flow measurement, hydrometeorologic measurements, and hydrograph analysis. Mr. Dingman. 3 lec/1 lab/4 cr.

710. GROUND-WATER HYDROLOGY
Principles governing occurrence, location, and development of ground water; well hydraulics, geophysical exploration, and chemical quality of water; use of fluid and electrical models; and selected problems. Basic course for hydrology majors and other qualified students. Prerequisite: one year of calculus. Mr. Hall. 3 lec / 1 lab / 4 cr.

Soil Science

501. SOILS AND THE ENVIRONMENT
Physical, chemical, and biological aspects of soils in the environment. Labs coordinate with lectures. Mr. Peterson. 3 lec/1 lab/4 cr.

502. SOIL-PLANT RELATIONSHIPS
Soils and the requirements for optimum growth of plants with emphasis on nutrient availability; soil needs for meeting world food problems are reviewed. Mr. Peterson. 3 lec/1 lab/4 cr.

602. CHEMICAL ANALYSIS OF SOIL
Methods of soil chemcial analysis. Prerequisite: Quantitative Analysis, permission of instructor. Mr. Harter. 1 lec/1 lab/2 cr.

603. SOIL AND WATER ENGINEERING
Engineering principles, and the control of water; precipitation and stream-flow measurement, hydrograph development, estimating run-off from a watershed, and the design of structures to control this run-off. Instrumentation and problem analysis. Mr. Hall. 3 lec / 1 lab / 4 cr.

605. MINERAL CYCLING IN TERRESTIAL ECOSYSTEMS
How minerals, primarily plant nutrients, are cycled in soils and plants; chemical, microbiological, and physical interactions in the soil; nutrient uptake; how these nutrients are replaced in undisturbed ecosystems; how the cycles are disrupted by man's activities; New Hampshire's dominant soil-plant communities; greenhouse experience and field trips. Prerequisite: SWS 501 and Botany 411 or Plant Science 421 or permission of instructor. Can not be taken for credit by Soil Science majors if credit received for SWS 502. Mr. Harter. Transportation fee. 3 lec/1 lab/4 cr.

701. PHYSICS OF SOILS
Soil as a physical system; textural and structural analysis of soils, water flow and retention, and heat and gas transfer; the physical properties of soil and plant growth; methods of soil physical analysis. Prerequisite: SWS 501 or permission of instructor. 3 lec/1 lab/4 cr.

702. CHEMISTRY OF SOILS
Chemical composition of soil; colloidal phenomena and the exchange and fixation of elements; cation exchange capacity and source of negative charge; inorganic reactions in soil and their effect on soil properties. Prerequisite: one year of college chemistry or permission of instructor. Mr. Harter. 3 lec/3 cr.

704. SOIL CLASSIFICATION AND MAPPING
Soil genesis, morphology, classification, and mapping; major classification systems used in the U.S. and throughout the world as they relate to man's uses of the soil. Transportation fee. Prerequisite: SWS 501 and an introductory geology course, or permission of instructor. Mr. Peterson. 3 lec/1 lab/4 cr.

795,796. INDEPENDENT WORK IN SOIL AND WATER SCIENCE
1) Soil-Plant Relationships; 2) Physics of Soils; Hydrology; 4) Chemistry of Water; 5) Chemistry of Soils; 6) Soil Classification. Majors must take 795 and 796 for two credits per semester in their senior year. Student may choose faculty consultant and topic. Interested students from other departments may enroll for two credits per course.

Inter-College Courses (INCO)

598,599. INDEPENDENT WORK-STUDY
598 (off-campus), 599 (on-campus). These courses are for students who wish to pursue a semester of independent study in disciplines not within the purview of a particular department. Students select the problem area in which they wish to work, create their own bibliography for reflection, and find their own channels to actively pursue the problem. Students must write a proposal identifying the manner in which they intend to pursue the study and obtain the sponsorship of a faculty member. The proposal should be submitted to the Teaching Learning Council of the appropriate college, via the college office. Students proposing to take these courses must have the signature of the Teaching Learning Council chairperson before registering for the courses. For information, please consult Dr. Phyllis Forbes, assistant to the president, Thompson Hall, or Dr. John G. Chaltas, Room 307A Dimond Library, chairperson of the Teaching Learning Council. 4 to 16 credits.

650. INTRODUCTORY STATISTICS
A selectable set of 1-credit modules. Permission required to register for only 1 credit or more than 5 credits per term. The total number of available modules will vary from term to term and eventually will include 10-12 modules. Offerings for a particular term will be listed in the College of Engineering and Physical Sciences office. Module topics include: 1) General Introduction; 2) Probability; 3) Least Squares, Regression, Correlation; 4) Planning Experiments; 5) Sampling; and 6) Non-parametric Methods. Students should consult with faculty in their major department in order to choose those modules which are pertinent to their field of study. The General Introduction module is a prerequisite for most modules. 1-12 cr. (May be repeated for credit.)

Italian

(See French and Italian)

Japanese

(See German and Russian)

Latin

(See Spanish and Classics)

Mathematics (MATH)

Chairperson: M. Evans Munroe

PROFESSORS: William L. Kichline, emeritus; Richard Balomenos, Edward H. Batho, A.H. Copeland, Jr., A. Robb Jacoby, Richard E. Johnson, Shan S. Kuo, M. Evans Munroe, Eric Nordgren, James Radlow, Shepley L. Ross, Robert J. Silverman

ASSOCIATE PROFESSORS: Homer Bechtell, Albert B. Bennet, Jr., William E. Bonnice, David M. Burton, Robert O. Kimball, Loren D. Meeker, Berrien Moore III, Samuel D. Shore, Donovan Van Osdol

ASSISTANT PROFESSORS: R. Daniel Bergeron, William E. Geeslin, Robert Russell, Albert O. Shar

401 (401). ELEMENTARY MATH I
Fractions, exponents, and radicals, factoring linear equations, areas and volume of geometric figures. Not for credit by students with one or more year of college preparatory mathematics. 4 cr.

(402) 402. ELEMENTARY MATH II
Basic algebra covering absolute value, inequalities, quadratic equations, two dimensional coordinate system, distance, slope, curve sketching, systems of equations, polynomials of higher order. Prerequisite: Math 401 or equivalent. (Not for credit by students with two or more years of college preparatory mathematics.) 4 cr.

403. INTRODUCTION TO DIGITAL COMPUTER PROGRAMMING
Development of algorithms and programs. Basic programming and programming structure utilizing FORTRAN IV language; use of an operating system, computer solution of numerical and non-numerical problems. For students planning no further studies in computer science. No credit toward a Math major. 2 cr.

405 (405). ELEMENTARY FUNCTIONS
Understanding of mathematical concepts as a preparation for calculus. Exponential, logarithmic, and trigonometric functions; trigonometric identities and equations; inverse functions; rational functions; graphs. Prerequisite: Math 402 or two years of high school mathematics. (Not for credit by students with 3 or more years of college preparatory mathematics.) 4 cr.

(410) 410. DIGITAL COMPUTER SYSTEMS
Algorithms and programs; FORTRAN IV language. Data representation, use of number systems, basic computer organization. Survey of computers, languages, and applications. Numerical and non-numerical problems. 4 cr.

416. MATHEMATICS OF BUSINESS AND ECONOMICS
Analytic geometry, integrals and derivatives, partial derivatives, max-min problems (in one and several dimensions), areas. Special testing program for student to proceed at own pace. Prerequisite: 3 college preparatory mathematics units. No credit toward a Math major. 4 cr. Cr/F.

(419). EVOLUTION OF MATHEMATICS
Mathematics from antiquity to the present day; origins of the various methods and branches. How and why mathematical concepts, such as number and geometry, evolved. Prerequisite: 3 college preparatory mathematics units. No credit toward a Math major. 4 cr.

(420) 420. FUNDAMENTAL MATHEMATICS
Topics selected from: Logic set theory, Probability, Statistics, Linear Algebra, Linear Programming, Game Theory, and Graph Theory. Not a preparation for calculus. Prerequisite: 3 college preparatory mathematics units. No credit toward a Math major. 4 cr.

425 (425). CALCULUS I
Analytic geometry and calculus. Instruction at various paces and a special testing program for student to proceed at own pace. Prerequisite: at least 3 college preparatory mathematics units including trigonometry. 4 cr.

(426) 426. CALCULUS II
Calculus of functions of one argument. Instruction at various paces and a special testing program for student to proceed at own pace. Prerequisite: Math 425. 4 cr.

429-430. HONORS CALCULUS
Functions of one argument; underlying theory and practice with techniques and applications. Prerequisite: permission of instructor. 4 cr.

510. MATHEMATICAL COMPUTER PROBLEMS
Programming, including FORTRAN IV; computer applications in mathematics. No credit if credit received for Math 410. Prerequisite: Math 527 or taken concurrently. 4 cr.

527 (527). DIFFERENTIAL EQUATIONS WITH LINEAR ALGEBRA
Linear differential equations, matrix algebra, linear transformations and change of basis, eigenvalues, linear systems, series solution of differential equations. Prerequisite: Math 426. 4 cr.

(528) 528. MULTIDIMENTIONAL CALCULUS
Partial differentiation; composite functions and chain rules; maxima and minima; transformations; vector algebra; vector functions; gradient, divergence, and curl; curves and surfaces; multiple, line, and surface integrals; integral theorems. Prerequisite: Math 527. 4 cr.

531 (531). INTRODUCTION TO ABSTRACT MATHEMATICS
Logic and set theory with applications to the development of the real number system. Prerequisite: Math 426. 4 cr.

611. ASSEMBLER LANGUAGE PROGRAMMING
Assembler-language coding and programming techniques. Data representation, systems organization, program segmentation, linkage of control sections, manipulation of bits or bytes, micro- and macro-programming. Input / output using system macros. Interrupts. Prerequisite: Math 410 or 510. 4 cr.

612. DATA STRUCTURES AND PROCESSES
Data structure programming techniques and program structure using a higher-level language. Linear lists, strings, arrays, trees, and graphs. Symbol tables, sorting and searching techniques. Data organization, record-oriented and stream-oriented data transmission, conversion techniques, and storage allocation. Prerequisite: Math 611. 4 cr.

621. NUMBER SYSTEMS FOR ELEMENTARY SCHOOL TEACHERS
Counting and set concepts, whole numbers, fractions, negative numbers, real numbers, numeration systems, inductive and deductive reasoning. A mathematical laboratory approach is used. Prerequisite: consent of instructor. Major credit only for elementary mathematics education majors. 4 cr.

622. GEOMETRY FOR ELEMENTARY SCHOOL TEACHERS
Deductive systems, metric geometry, congruence, symmetry, parallelism, similarity, transformations, measurement, polygons and circles, polyhedra. A mathematical laboratory approach is used. Prerequisite: Math 621. Major credit only for elementary mathematics-education majors. 4 cr.

623. TOPICS FOR ELEMENTARY SCHOOL TEACHERS
Modulo arithmetic, logic and flow charting, coordinate systems, graphing, linear equations and applications, quadratic equations and applications, combinations, permutations, probability, statistics. A mathematical laboratory approach is used. Prerequisite: Math 621. Major credit only for elementary mathematics-education majors. 4 cr.

(636). PROBABILITY AND STATISTICS
Sample spaces (discrete only), events, combinations, conditional probability, independence, distributions, expectation, statistical description, random vaiables, sampling, estimation, tests, and applications. Credit towards a mathematics major only in mathematics-education. 4 cr.

645. APPLIED LINEAR ALGEBRA
Applied matrix theory; eigenvalue problems and their applications in mathematics, physics, and engineering; systems of linear, ordinary, differential equations. Prerequisite: Math 410 or equivalent; Math 527-528. 4 cr.

(646). ANALYSIS FOR APPLICATIONS
Initial-boundary-value problems of mathematical physics; Sturm-Liouville problems; series expansions by orthogonal functions; Green's functions; numerical methods. Prerequisite: Math 410 or equivalent; Math 527-528. 4 cr.

(647). COMPLEX ANALYSIS FOR APPLICATIONS
Complex numbers; complex integration; infinite series; contour integration; conformal mapping; Fourier and Laplace transforms; Wiener-Hopf techniques. Prerequisite: Math 528. 4 cr.

656. INTRODUCTION TO NUMBER THEORY
Unique factorization, linear and quadratic congruences, quadratic reciprocity law, arithmetic functions, quadratic forms, an introduction to algebraic numbers. Prerequisite: Math 531. 4 cr. (Alternate year)

657. GEOMETRY I
Advanced approach to fundamental properties of Euclidean geometry. Prerequisite: Math 531. 4 cr.

658. GEOMETRY II
Systems of postulates of various geometries, geometric invariants, synthetic and analytic projective geometry, introduction to non-Euclidean geometry. Prerequisite: Math 531. 4 cr. (Alternate year.)

682. NONLINEAR DIFFERENTIAL EQUATIONS
Phase plane analysis of autonomous systems; critical points; limit cycles; periodic solutions; approximate methods for second-order nonlinear equations; stability and asymptotic behavior of solutions. Prerequisite: Math 527. 4 cr. (Alternate year.)

(696) 696. INDEPENDENT STUDY
Projects of interest and value to student and department. Prerequisite: permission of faculty supervisor and department chairperson. 1-6 cr.

(698). SENIOR SEMINAR
Study and reports on special topics. Prerequisite: senior standing in mathematics-education. 4 cr.

703. MATHEMATICS-EDUCATION, K-6
Psychological theories of teaching; elementary curriculum projects; laboratory approach in teaching; survey including history, present theories, education objectives, and research. Prerequisite: Math 621 or equivalent. 2-4 cr.

710. ADVANCED PROGRAMMING SYSTEMS
Review of batch-process systems programs. Software organization; multiprogramming systems; techniques for parallel processing; multiaccessing and multiprocessing. Core management, file system design and management, and system accounting. Design of system modules and interfaces. Prerequisite: Math 611. 4 cr.

711. PROGRAMMING LANGUAGE AND COMPILER CONSTRUCTION
Formal definition of programming languages; specification of syntax and semantics. Global properties of algorithmic languages such as PL/I and ALGOL. Review of special purpose languages for list processing, symbol manipulation, data description and simulation; run-time representation of program and data structures; how these properties affect compilation. Prerequisite: Math 710. 4 cr.

713. COMPUTER GRAPHICS
Input-output and representation of pictures from hardware and software points of view; interactive techniques and their applications; development of an interactive graphics system. Prerequisite: permission of instructor. 4 cr.

735. PROBABILITY
Sample spaces (discrete and continuous); random variables; conditional probability; moments; binomial, Poisson, and normal distributions; limit theorems for sums of random variables. Prerequisite: Math 528. 4 cr.

736. STATISTICS
Sampling theory, estimation of parameters, testing of hypotheses, nonparametric methods. Prerequisite: Math 735. 4 cr.

753. NUMERICAL METHODS AND COMPUTERS I
Use of numerical analysis on computers; high-level languages, compilers; linear and non-linear equations; interpolation, quadrature, curve fitting, system simulations, optimization techniques, finite elements, computer graphics. Selected algorithms will be programmed for computer solution. Prerequisite: Math 410 or 510, and 426. 4 cr.

754. NUMERICAL METHODS AND COMPUTERS II
Computer solutions of ordinary and partial differential equations, finite differences vs. finite elements, eigenvalues and eigenvectors, algorithms for hidden-line graphics. Mathematical software. Prerequisite: Math 410 or 510, and 527. 4 cr.

761 (761). ABSTRACT ALGEBRA
Basic properties of groups, rings, fields and their homomorphisms. Prerequisite: Math 531. 4 cr.

762. LINEAR ALGEBRA
Vector spaces, linear transformations, matrices, determinants, dual spaces, eigenvalues, spectral and canonical decomposition theorems. Not for credit if credit received for Math 645. Prerequisite: Math 761. 4 cr.

764. ADVANCED ALGEBRA
Vector spaces, modules over principal ideal domains, structure of finitely-generated modules, finite abelian groups, elementary theory of fields. Prerequisite: Math 761. 4 cr. (Alternate years.)

767. ONE-DIMENSIONAL REAL ANALYSIS
Theory of limits, continuity, differentiability, integrability, series, uniform convergence. Prerequisite: Math 528, 531. 4 cr.

768. ABSTRACT ANALYSIS
Metric spaces, function spaces, theory of uniform limits. Prerequisite: Math 767. 4 cr. (Alternate year.)

(769). MULTIDIMENSIONAL REAL ANALYSIS
Partial derivatives, multiple integrals, line and surface integrals, Fourier series. Prerequisite: Math 767. 4 cr. (Alternate years.)

776. LOGIC
Formal mathematics and formal systems. Consistency, completeness, decidability. Prerequisite: Math 531. 4 cr. (Alternate years.)

780. THEORY OF ORDINARY DIFFERENTIAL EQUATIONS
Fundamental existence and uniqueness theorems; linear systems and higher order linear equations; Wronskian theory; classical Sturm Theorem and generalizations; boundary value problems for second order linear equation. Prerequisite: Math 767. 4 cr. (Alternate years.)

781. PARTIAL DIFFERENTIAL EQUATIONS
First order equations; linear second order equations; Cauchy problem; Dirichlet problem; application to physics. Prerequisite: Math 767. 4 cr. (Alternate years.)

(784). TOPOLOGY
Connectedness, compactness, metrizability; with special emphasis on real line and plane. Prerequisite: Math 531. 4 cr.

(785). ALGEBRAIC METHODS IN TOPOLOGY
Topology of manifolds, topological groups, homology, knot theory. Prerequisite: Math 784. 4 cr. (Alternate years.)

(786). CALCULUS ON MANIFOLDS
Differentiable manifolds; differential forms; exterior and Grassman algebras; integration of differential forms; Stokes theorem; closed and exact differential forms. Not for credit if credit received for Math 769. Prerequisite: Math 762 and 767. 4 cr. (Alternate years.)

(787). DIFFERENTIAL GEOMETRY
Introduction to Lie groups and frame bundles; differential invariants of surfaces and curves; local theory of surfaces Prerequisite: Math 786. 4 cr. (Alternate years.)

788. COMPLEX ANALYSIS
Complex functions, sequences, limits, differentiability and Cauchy-Riemann equations, elementary functions, Cauchy's theorem and formula, Taylor's and Laurent's series, residues, conformal mapping. Not for credit if credit received for Math 647. Prerequisite: Math 767. 4 cr.

(791). MATHEMATICS-EDUCATION
Methods of teaching mathematics in the secondary school. Prerequisite: Education 500. 4 cr.

Mechanical Engineering (M E)

Chairperson: William Mosberg

PROFESSORS:E. Howard Stolworthy, emeritus; Robert W. Corell, Godfrey H. Savage, Charles K. Taft, Asim Yildiz
ADJUNCT PROFESSOR:Victor D. Azzi
ASSOCIATE PROFESSORS: E. Eugene Allmendinger, Wayne M. Beasley, Frederick G. Hochgraf, Tenho S. Kauppinen, David E. Limbert, William Mosberg, Russell L. Valentine, John A. Wilson
ASSISTANT PROFESSORS: William E. Clark, emeritus; Barbaros Celikkol, Harvard B. Emery
SENIOR RESEARCH FELLOW: Musa Yildiz
LECTURER: M. Robinson Swift

341. INTRODUCTION TO MANUFACTURING
Safe operation of basic machine tools in design projects or home workshop. Two 2½-hour weekly sessions for 6 weeks (offered twice each semester). 0 cr.

401. INTRODUCTION TO MECHANICAL ENGINEERING
Goals and interactions of mechanical engineering in contemporary society. Basic concepts presented and developed as background for future course work. Lectures, case studies, and laboratories. Required of freshmen; open to others by permission of the department. 4 cr.

413 (413). ENGINEERING GRAPHICS
Analysis of engineering problems using fundamentals of descriptive geometry. This course is identical with the first half of M.E. 441 and ends at mid semester. 2 lab/2 cr.

414 (414). ENGINEERING GRAPHICS
Analysis of engineering problems using fundamentals of descriptive geometry. This course is identical with the second half of M.E. 441 and starts at mid semester. Prerequisite: M.E. 413 or equivalent. 2 lab/2 cr.

441 (441). ENGINEERING GRAPHICS
Communication of engineering information and three-demensional concepts by multiview drawings, pictorial views, sketches, and graphs; including the fundamentals of descriptive geometry. 2 lab / 4 cr.

503 (503). THERMODYNAMICS I
Laws of thermodynamics and their relation to working substances. Prerequisite:Math 426. 4 cr.

504. THERMODYNAMICS II
Laws of thermodynamics and their application to real systems. Behavior of ideal and real media; thermodynamics of non-reactive and reactive mixtures; power and refrigeration cycles. Prerequisite: M.E. 503. 4 cr.

505. INTRODUCTION TO THERMODYNAMICS AND HEAT TRANSFER
First and second laws of thermodynamics; selected applications. Elementary topics in conductive radiative and convective heat transfer. Not for Mechanical Engineering majors. Prerequisites: Math 425, Physics 407. 3 cr.

506. INTRODUCTION TO FLUID DYNAMICS AND CONVECTIVE HEAT TRANSFER.
Dynamics and thermodynamics of compressible and incompressible fluid flow. Elementary topics in boundary layer theory and convective heat transfer. Not for Mechanical Engineering majors. Prerequisites: M.E. 505. 3 cr.

508. FLUID DYNAMICS
Dynamics and thermodynamics of compressible and incompressible fluid flow; behavior of fluids as expressed by hydrostatic, continuity, momentum, and energy equations. Prerequisite: M.E. 503 and 527. 4 cr.

525-526-527. MECHANICS I, II, AND III
Static and dynamic behavior of rigid and deformable bodies. Equilibrium, compatability, and force-deformation relations; stress, strain, and constitutive relations; elastic stability; energy methods, stress and deformation in materials and simple structural elements. Review of particle dynamics; kinematics and kinetics of rigid bodies in two and three dimensions. Prerequisite: Math 425 and Physics 407. 3 cr.

541. MANUFACTURING PROCESSES AND DESIGN
Manufacturing drawings, sketching basic mechanisms found in machine shops, operation of basic machine tools. Two 2-½-hour lec-lab/4 cr.

542. METHODS IN MANUFACTURING
Project course for more experience on machine tools Prerequisite: M.E. 541. Two 2-½-hour lab/2 cr.

561. INTRODUCTION TO MATERIALS SCIENCE
Theoretical and experimental studies of the structure and thermodynamics of solids. 3 lec/1 lab/4 cr.

562. INTRODUCTION TO MATERIALS ENGINEERING
Physics and chemistry of selected processes in materials technology. Phase transformations in ceramics and ferrous alloys, sintering, solidification, semiconductor device fabrication. Extended lab hours for plant visits. 3 lec/1lab/4 cr.

628. INTRODUCTION TO VIBRATIONS
Theory and application of mechanical and system vibrations. Single and multiple degrees of freedom; free and forced systems; development of closed form or approximate solutions using mathematical techniques and the computer. Introduction to continuous systems. Prerequisite: M.E. 527 or equivalent. 3 cr.

643-644. ELEMENTS OF DESIGN I AND II
Synthesis, analysis, and design of machine components. Development of engineering judgement; selection of materials; kinematic arrangements; design factors; failure criteria; fluctuating loads; design for finite and infinite life; stress concentration; finite element method; statistical methods. Prerequisite: M.E. 525, 526 and 527. 4 cr.

646. DETERMINISTIC AND STOCHASTIC MEASUREMENT
The dynamic analysis of instrumentation systems; measurement errors, measurement system synthesis for specified dynamic accuracy and methods of correcting data with dynamic errors. Stochastic processes. Fourier transforms, power spectral density and auto-correlation functions and their application to measurements on systems with random excitation. 4 cr.

648. INTRODUCTION TO MEASUREMENT AND EXPERIMENTAL METHODS
Required for junior M.E. students. Experimental methods, transducers, signal processing instrumentation, and experimental errors. Experiments involving the static and dynamic measurements and display of mechanical variables using typical mechanical and electrical transduction and signal handling methods. Prerequisite: junior standing. 3 cr.

691. ECONOMIC DECISION MAKING IN ENGINEERING
Economic optimization of engineering problems. Prerequisite: senior standing. 4 cr.

695 a-d - 696 a-d. MECHANICAL ENGINEERING UNDERGRADUATE PROJECTS AND INDEPENDENT STUDY
Course numbers refer to topics in a) thermal science, b) solid mechanics, c) engineering design, and d) materials, respectively. 2-4 cr.

697,698. MECHANICAL ENGINEERING SEMINAR
Study and discussion of engineering topics; student-faculty participation. 1 cr.

699. UNDERGRADUATE THESIS
2-4 cr.

701. MACROSCOPIC THERMODYNAMICS
Thermodynamic principles using an analytic, postulational approach and Legendre transformations to obtain thermodynamic potentials. 4 cr.

702. STATISTICAL THERMODYNAMICS
Macroscopic thermodynamic principles developed by means of microscopic analysis. Prerequisite: M.E. 503. 4 cr.

703. HEAT TRANSFER
Analysis of phenomena; steady-state and transient conduction, radiation, and convection; engineering applications. Prerequisite: M.E. 508 or taken concurrently. 3 cr.

704. EXPERIMENTAL HEAT TRANSFER
Methods in the study and solution of problems, including a critical comparison with analytical and other methods. Prerequisite: M.E. 703. 4 cr.

707. ANALYTICAL FLUID DYNAMICS
Development of the Navier-Stokes equations; vorticity theorems; turbulence and boundary-layer theory. Prerequisite: M.E. 508. 4 cr.

708. GAS DYNAMICS
Basic equations of motion of one-dimensional, subsonic and supersonic flows of compressible, ideal fluids. Wave phenomena. Rankine-Hugoniot relations. Linear approach to two-dimensional flow problems. Prerequisite: M.E. 508. 4 cr.

715. INTERNAL COMBUSTION ENGINES
Basic and engineering science applied to spark and compression-ignition engines; design, management and reporting of experimental studies. Prerequisite: M.E. 503. 4 cr.

716. PROPULSION SYSTEMS
Basic engineering science applied to the engineering problems of propulsion systems. Prerequisite: M.E. 508. 4 cr.

717. CRYOGENICS
Phenomena and processes at very low temperatures. Basic engineering sciences applied to problems of low temperature refrigeration, liquefaction, separation, and storage; transport of cryogenic fluids; measurement systems; vacuum technology. Prerequisite: M.E. 503. 4 cr.

723. ADVANCED DYNAMICS
Classical dynamics oriented to contemporary engineering applications. Review of particle dynamics. Hamilton's principle and the Lagrange equations. Kinematics and dynamics of rigid bodies, gyroscopic effects in machinery and space structures. 4 cr.

724. VIBRATION THEORY AND APPLICATIONS
Discrete vibrating systems. Linear system concepts; single-degree-of-freedom system with general excitation. Matrix theory and eigenvalue problems. Many degrees of freedom, normal mode theory for free and forced vibration. Numerical methods; introduction to continuous systems; applications to structural and mechanical systems. Prerequisite: M.E. 628. 4 cr.

726. EXPERIMENTAL MECHANICS
Experimental methods and theoretical bases applied to measurement of stress, strain, and motion. Transmitted and scattered-light photoelasticity; strain gage applications; brittle coating and grid techniques; dynamic measurements, and associated instrumentation. 4 cr.

727. ADVANCED MECHANICS OF SOLIDS
Beams on elastic foundation, curved bars, inelastic behavior, instability, introduction to thin plates and shells, introduction to elasticity, energy methods, and numerical methods. 4 cr.

730. MECHANICAL BEHAVIOR OF MATERIALS
Elastic and inelastic behavior of materials in terms of micro- and macromechanics. Stress, strain, and constitutive relations related to recent developments in dislocation theory and other phenomena on the atomic scale and to continuum mechanics on the macroscopic scale. Elasticity, plasticity, visoelasticity, creep, fracture, and damping. Anisotropic and heterogeneous materials. 4 cr.

737. OCEAN MECHANICS I
Ocean as a continuous medium, its mechanical and thermodynamic properties. Shallow and deep ocean modeling for the investigation of gravity and sound waves. Ocean subbottom and its soil mechanical and sound propagation properties. Instrumentation, rudimentary data collecting and processing procedures, and computer usage. Prerequisite: M.E. 508 and 525, 526, 527; Math 527, 528. 4 cr.

738. OCEAN MECHANICS II
Ocean dynamical laws are generalized to include temperature and salinity variations in the water column. Conservation laws with generalized equation of state. Air-sea interaction, energy transport phenomena, reflection from different coastal geometry, harbour resonances, internal currents. Sound reflection from subbottom, sound probing techniques to determine subbottom properties by ray theory and generalization of subbottom soil from an elastic to a visoelastic medium. Prerequisite: M.E. 737; M.E. 781 is desirable but not required. 4 cr.

741. CONTROL OF PHYSICAL SYSTEMS
Mathematical modeling of hydraulic, pneumatic, and fluidic control elements and control systems. Analysis of systems using gases or liquids as the working fluid. Methods for the synthesis of the parameters of the control elements used in automatic control systems and design of these systems. 4 cr.

751. NAVAL ARCHITECTURE IN OCEAN ENGINEERING
Fundamentals of naval architecture in ocean environments applied to conventional and advanced surface, semi-submersible, and submersible vehicles. Geometric considerations, hydrostatic characteristics, and basics of powering and principle rules are covered. Prerequisites: M.E. 508 and M.E. 525 or permission of instructor. 4 cr.

752. SUBMERSIBLE VEHICLE SYSTEMS DESIGN
Conceptual and preliminary design of submersible vehicle systems; submersibles, environmental factors, hydromechanic and structural principles, materials, intra / extra-vehicle systems, operating considerations, pre-design and design procedures. Design projects are selected and completed by student teams. Prerequisite: permission of the instructor. 4 cr.

757. COASTAL ENGINEERING AND PROCESSES
Water waves and their effects. Equations for surface waves and laboratory tank demonstration of wave trains, beat waves, and wave spectra. Estuarial and coastal processes including wave refraction and long shore transport of sediments simulated by computer models. Effects on structures of waves and functional design of structures including towers, breakwaters. 4 cr.

761. X-RAY DIFFRACTION
The physics of x-ray diffraction, the reciprocal lattice, lattice parameter determinations, space group identification, phase identification, characterization of preferred orientation. 3 lec/1 lab/4 cr.

763. MICROSTRUCTURE OF SOLIDS
Basic concepts and measurements; statistically exact expressions for points, lines, surfaces, and volumes; random, partially-oriented and oriented structures; particle and grain characteristics and distributions; projected images and shape specification. 4 cr.

766. PHYSICAL CERAMICS
Characteristics of crystalline and non-crystalline ceramic solids; defect stuctures; diffusion in ceramic materials; nucleation, crystal growth, and solid-state reactions; kinetics of grain growth, sintering, and vitrification. 4 cr.

781. MATHEMATICAL METHODS IN ENGINEERING SCIENCE—I
Solution of discrete and continuous systems. Review of calculus, linear algebra, complex numbers, Fourier series, differential and partial differential equations with examples from acoustics, vibration theory, hydrodynamics, elasticity, solid mechanics, transport theory, and particle mechanics. 4 cr.

793 a-d - 794 a-d. SPECIAL TOPICS IN ENGINEERING
Course numbers refer to topics in a) thermodynamics, b) mechanics, c) engineering design, and d) materials, respectively. Content of these courses may vary from year to year. 2-4 cr.

795 a-d, 796 a-d. INDEPENDENT STUDY
Course numbers refer to topics in a) thermal science, b) solid mechanics, c) engineering design, and d) materials, respectively. 2-4 cr.

Medical Technology (MEDT)

Acting Chairperson: Karol A. LaCroix

ADJUNCT ASSOCIATE PROFESSOR: John C. Neff
ADJUNCT ASSISTANT PROFESSOR: Allan W. Handy
LECTURER: Karol A. LaCroix
ADJUNCT LECTURER: Denis J. Carlson

School of Medical Technology, Hanover, New Hampshire
ADJUNCT ASSISTANT PROFESSOR: E. Elizabeth French M.D.
CLINICAL INSTRUCTOR: Elizabeth A. Ward
LECTURERS: Carla Coates, Miriam K. Fogg, Gertrude M. Marquay, Robert Patton, Robert Strohsahl

(401). INTRODUCTION TO MEDICAL TECHNOLOGY
Functions and responsibilities of medical technology as a unit of the health team. Lectures, films, demonstrations, and field trips. For second-semester freshman and sophomore majors. 0 cr.

625. CLINICAL MICROSCOPY
Identification and analysis of cellular elements of peripheral blood, bone marrow, and urine and their relationship to the body in health and disease. Prerequisite: Zoo. 507, 508. 2 lec/2lab/4 cr.

(696) 696. INDEPENDENT STUDY
In depth studies under faculty supervision, Staff. Prerequisite: junior standing, approval of the major adviser and the faculty of the area concerned. 2-4 cr.

720. CLINICAL MICROBIOLOGY
Culture, isolation, antibiotic sensitivities, and identification procedures for routine clinical bacteriology, parasitology, and mycology specimens. Prerequisite: Micro. 702. 2 lec / 2 lab / 4 cr.

761(761). DIAGNOSTIC MICROBIOLOGY METHODS
Processing, evaluating, and identifying clinical bacteriology, mycology, and parasitic specimens. Routine methodologies and, special procedures such as flourescent techniques, antibiotic sensitivity testing, and nosocomial infections. Senior Med Tech majors only. 8 cr.

(762)762. CLINICAL HEMATOLOGY
Review of routine and special hematology procedures, manual and automated methods. Lab results analyzed and interpreted in relation to diseases of the white cells, red cells, and platelets. Senior Med Tech majors only. 6 cr.

763(763). CLINICAL IMMUNOLOGY
Familiarization with clinical serological techniques involving agglutination, precipitin, and hemolysin reactions. Principles and procedures of serological tests for syphilis, mononucleosis, rheumatoid factor, ASO hepatitis, rubella, etc. Senior Med Tech majors only 4 cr.

764(764). CLINICAL CHEMISTRY
Practice in the operation, evaluation, and maintenance of automated and manual chemistry systems. Laboratory analyses of steriods, carbohydrates, proteins, lipids, biliary systems, enzymes, blood gases, isotopes, hormones, toxicology. Data analysis and quality control stressed. Senior Med Tech majors only. 8 cr.

765(765). CLINICAL IMMUNOHEMATOLOGY
Routine and special blood bank principles and procedures. Proficiency in blood typing, antibody screening and identification, cross matching, record keeping, and component therapy. Senior med tech majors only. 4 cr.

(766)766. CLINICAL URINALYSIS
Laboratory examination of urines and other body fluids using routine and special determinations. Senior Med Tech majors only. 2 cr.

Merrimack Valley Branch

Dean: Roger Bernard

General Education (MVGE)

411. EXPLORING HUMAN BEHAVIOR
Team-taught interdisciplinary course. Causes and expressions of individual behavior examined through films, panel discussions, lectures, and small group discussions. How human behavior differs and resembles behavior of animals; how persons strive for and express personal identity and integrity; how humans learn; how society—particularly the family—affects identity and behavior. Three, five-week units: 1) process of acquiring a personal identity; 2) how society helps to shape who we are and, consequently, what we do; 3) three in-depth modules concerning cross-cultural, child-rearing techniques and the family; deviant behavior; and behavioral control. Course is highly recommended for entering college students, persons in human service or considering business careers, and students taking courses in the social sciences. 4 cr.

412. EXPLORING HUMAN BEHAVIOR II
Team-taught interdisciplinary course. Human and animal social behaviors examined through films, lectures, and modules. Similarities and differences between the social behavior of man and animals; man as a political animal—motives, behaviors, and effects of political activity; "total institution" settings and their effects on those confined within; varitey of behaviors appropriate to helping relationships involving professional helpers and clients. Open to all students but recommended to social science majors, students in the human service area, and students enrolled in Exploring Human Behavior I. 4 cr.

461. LITERARY VIEW OF MAN THROUGH MYTH AND LEGEND I
Historical perspective on the growth of myth as it originates, becomes religion, and eventually develops into an artistic ideal. Detailed analysis of the epic, the Greek tragedy, and the metrical romance. 4 cr.

462. LITERARY VIEW OF MAN AND SOCIETY: RENAISSANCE TO THE PRESENT II
The hero from the revolutionary Luther to the fantasy James Bond. How do writers view ideal man in the Rennaissance, in rigid 18th century England, in free 19th century America, and in the anxious 20th century? 4 cr.

512. THE NATURE OF MAN AND WESTERN SOCIETY II
Interdisciplinary study of themes and issues: growth and impact of science on western culture; rise of secularism in capitalism, religion, and rationalism; the emergence of mass society and the end of economic man; the meaning of totalitarianism for man and western society; and what we face in the future. 4 cr.

General Studies

599. SPECIAL TOPICS
Flexible course structure permits independent research, study, or group discussion of advanced material not covered in regular course offerings in an Option. Offering of this course will depend on availability of staff. May not be taken more than twice if credits count toward the associate degree. Variable 1-4 cr.

Humanities (MVH)

464. ART AS RITUAL AND MAGIC
Understanding how humans have expressed their response to forces they could not fully comprehend. A comparative study relates primitive Egyptian, American Indian, Oceanic, African Art, etc., with contemporary man's response to similar or, in some cases, the same forces. Shamanism, myths, rituals, symbols, talismans, gods, religious and psychological beliefs. 4 cr.

Human Services (MVHS)

431. SOCIAL ASPECTS OF HEALTH AND ILLNESS: SOCIOLOGY OF MEDICINE
Meaning of health and illness as social categories. Topics include: role of the sick; social factors in health and illness; careers in the health professions; the hospital as an organization; delivery systems of health care in New Hampshire and specifically in the greater Manchester area. 4 cr.

530. SOCIOLOGY OF MENTAL HEALTH AND ILLNESS
Meaning of mental health and illness; major theoretical models. Social and psychosocial factors in the incidence and distribution, diagnosis, and treatment of mental disorders; community psychiatry; cross-cultural perspectives on research findings. For students interested in or employed by community, state, or federal mental health and welfare programs. 4 cr.

Natural Sciences (MVNS)

441. THE NATURAL HISTORY OF NORTH AMERICA I
Major freshwater and marine communities of North America. Lakes, streams, and estuaries and the geological factors which create them; plants and animals common to each; the ways organisms respond to these environments. Course is divided into two, one-credit and one, two-credit modules. Students may register for any combination. Slides, films, and other audio-visual techniques; field trip required for each module. Recommended for students in career options, the B.G.S. program, and anyone interested in outdoor recreation or the natural world. Students considering a major in the life sciences at UNH should take Bot. 411 or Zoo. 412 instead. Variable 1-4 cr.

442. NATURAL HISTORY OF NORTH AMERICA II
Major land communities of North America. Forests, deserts, and grasslands and the geological factors which create them; plants and animals common to each; ways organisms respond to these environments. Course is divided into two, one-credit and one, two-credit modules. Students may register for any combination. Field trip required for each module. Recommended for students in career options, the B.G.S. program, and anyone interested in outdoor recreation or the natural world. Students considering a major in the life sciences at UNH should take Bot. 411 or Zoo. 412 instead. Variable 1-4 cr.

Social Sciences (MVSS)

415. COMMUNES AND UTOPIAN SOCIETIES: MAKING THE FUTURE NOW
Current alternatives to American society in the form of utopian and communal experiments. Visit to an ongoing commune; field trips to a Shaker community and Plymouth Plantation; case studies of past utopian and communal efforts. Non-American alternate societies: the Israeli kibbutz and recently developing communes in the Peoples Republic of China. 4 cr.

422. THE NATURE OF MAN AND SOCIETY: FREEDOM AND LIBERTY
Continuity and change in concepts of: man, theories of government and social structure, and principles of freedom and liberty, which helped to form Western culture from the Renaissance to the present. Readings will include works of Machiavelli, Locke, Paine, Marx, Engels, Freud, Sartre, and Marcuse. 4 cr.

525, 526. PERSPECTIVES IN SOCIAL WELFARE I & II
Social welfare policies, practices, and institutions from the Colonial era to the present. Lecture, discussion, and field trips to relevent agencies. Each semester is divided into two modules. 525: 1) issues of poverty, dependency, and related welfare practices; 2) growth of social welfare institutions with an emphasis on treatment of the aged, infirm, and mentally ill. 526; 1) crime and delinquency through a study of juvenile and adult criminal justice systems; 2) policies and practices applying to child and family services. Students may elect either or both modules with two credit hours assigned to each module. 2 or 4 cr.

Microbiology (MICR)

Chairperson: Galen E. Jones

PROFESSORS: William R. Chesboro, Galen E. Jones, Theodore G. Metcalf, Lawrence W. Slanetz
ASSISTANT PROFESSORS: Thomas G. Pistole, Robert M. Zsigray

501. PUBLIC HEALTH AND SANITATION
Cause, nature, incidence, and control of communicable diseases of man. Microbiology and public health aspects of water, wastewater disposal, foods, and air. Public Health administration. 3 lec/3 cr.

502. PUBLIC HEALTH MICROBIOLOGY LABORATORY
Laboratory techniques for identification of important pathogenic microorganisms, disease diagnosis, and bacteriological examination of water, wastewater, food, and air. (Students must register for Micro. 501 concurrently.) 1 lab / 1 cr.

503. GENERAL MICROBIOLOGY
Principles of microbiology; morphology, physiology, genetics, and classification of bacteria and other microorganisms, and their relationships to agriculture, industry, sanitation, and infectious diseases. Prerequisite: Chemistry 401-402 or equivalent. 2 lec / 2 lab / 4 cr.

600. ENVIRONMENTAL MICROBIOLOGY
Detection, identification, and regulation of microorganisms which enhance or deteriorate the immediate human environment. Prerequisite: Micro. 503. 2 lec/2 lab/4 cr.

702. PATHOGENIC MICROBIOLOGY
The morphological, cultural, biochemical, serological, and pathogenic characteristics of microoganisms causing human and animal diseases. Prerequisite: Micro. 503. 2 lec/2 lab/4 cr.

705. IMMUNOLOGY AND SEROLOGY
Defensive elements possessed by man and animals protected against infectious microorganisms. Principles of serological techniques for recognition and identification of biological materials including microorganisms. Preparation of vaccines and production of antisera in animals. Prerequisite: Micro. 702. 2 lec/2 lab/4 cr.

706. VIROLOGY
Viruses, including animal and bacterial, and rickettsiae; interaction of viruses and host cells; techniques for propagation and recognition including immunologic methods; applications to infectious disease, the environment and cancer. Prerequisite: Micro. 702. 1 lec / 3 lab / 4 cr.

707. MARINE MICROBIOLOGY
Characterization of microoganisms in the sea including taxonomy, physiology, and ecology; sampling, enumeration, distribution; and effects of marine environment upon microbial populations. Prerequisite: Micro. 503 and organic chemistry. 2 lec/1 lab/4 cr.

708. MICROBIAL BIOGEOCHEMISTRY
Geochemical processes influenced by biochemical processes catalyzed by marine and terrestrial microorganisms; transformations of carbon, nitrogen, and other elements. Petroleum microbiology, natural gas production, sulfur formation, ferromanganese nodules, corrosion, and fossil microorganisms. Prerequisite: Micro. 503 and organic chemistry. 2 lec / 1 lab / 4 cr.

795,796. PROBLEMS IN MICROBIOLOGY
Prerequisite: permission of department chairperson and staff. 4 cr.

Military Science (MS)
Reserve Officers Training Corps

PROFESSOR OF MILITARY SCIENCE: Lieutenant Colonel Wilfred W. West
LECTURERS: Major David B. Bradley, Captain William E. Whitaker, Captain Michael T. Byrnes, Captain Carl E. Morse
ADMINISTRATIVE: N.E. Bernier, Property Officer

331-332. PROFESSIONAL DEVELOPMENT AND ENRICHMENT SUBJECT
The duties and responsibilities of junior Army leaders and orientation on the branches of the Army. 0 cr.

341-342. PROFESSIONAL DEVELOPMENT AND ENRICHMENT SUBJECT
Leadership development through practical exercises and actual leadership problems. Prerequisite: permission of instructor.

413. THE DEFENSE ESTABLISHMENT AND NATIONAL SECURITY I
United States defense establishment and its role in national security. The U.S. Army and its role in relation to the other armed services and to civilian control of the military. 1 lec/1 lab (required only of cadets)/1 cr.

414. THE DEFENSE ESTABLISHMENT AND NATIONAL SECURITY II
Major Army commands and the roles of separate operating agencies; the organization and composition of combat units. 1 cr.

525. AMERICAN MILITARY HISTORY I
Study of the development of American military institutions, strategy, traditions and civil-military relations in war and peace from the Colonial period to 1898. 2 cr.

526. AMERICAN MILITARY HISTORY II
The institutions and policies of the military during the 20th century as its role shifts from defense to prevention of war. 2 cr.

632. MILITARY LEADERSHIP AND MANAGEMENT
Human relations, interpersonal communications, and group interaction. Authoritarian vs. participative leadership, self-actualization and fulfillment. Theory of teaching methods; examination of leadership models. 3 lec/1 lab (required only of cadets)/4 cr.

(641). SEMINAR ON LEADERSHIP AND MANAGEMENT
Military team concept and the coordination and planning necessary between elements of the team; analysis of contemporary problems; discussion of military justice system. 3 sem/1 lab (required only of cadets)/4 cr.

Music

Chairperson: Paul F. Verrette

PROFESSORS: Karl Bratton, emeritus; Donald E. Steele, John D. Wicks
ASSOCIATE PROFESSORS: Irving D. Bartley, emeritus; Mark DeVoto, Alan Grishman, Cleveland Howard, Keith Polk, Mary Rasmussen, John Rogers, David Seiler, John Whitlock, Henry Wing
ASSISTANT PROFESSORS: Ruth Edwards, Stanley Hettinger, Ada-Louise Rogers, Niel Sir, Paul Verrette, James R. West
LECTURERS: Donald Bravo, Gordon Cole, John Skelton, Patricia Stedry

History, Literature, and Appreciation (MUSI)

401(401). INTRODUCTION TO MUSIC
A fundamental approach to perceptive listening, based on a detailed study of several masterpieces representing different periods and forms. Historical perspective, but the main emphasis is on confronting significant works of musical art on their own terms. Some participation in the musical life of the University required. Not open to music majors. 4 cr.

402. SURVEY OF MUSIC HISTORY
The historical development of musical style in relation to the whole fabric of Western civilization. Prerequisite: Mu. 401. Not open to music majors. 4 cr.

501,502. HISTORY AND LITERATURE OF MUSIC
The styles, forms, and techniques of composition in Western music. Required of all music majors.4 cr.

511. SURVEY OF MUSIC IN AMERICA
From Colonial times to the present, including the various European influences, the quest for an American style, and the emergence of such indigenous phenomena as jazz. 4 cr.

513. INTRODUCTION TO THE MUSIC OF AFRICA AND ASIA
Folk and classical music of various ethnic cultures, particularly those of Japan, India, and sub-Saharan Africa.4 cr.

595. SPECIAL TOPICS IN MUSIC LITERATURE
Open to music majors and non-majors; topics in areas not easily covered in historical courses. May be repeated for credit. Prerequisite: permission of instructor.1-4 cr.

701. MUSIC OF THE MEDIEVAL PERIOD
The nature of the beginnings of polyphony. The pre-eminent influence of the church in the 13th century and the rising secular movement in the 14th. Music as a dominant force in the political and social life of the Middle Ages. 4 cr.

703. MUSIC OF THE RENAISSANCE
Works of 15th and 16th century composers from Dunstable to Palestrina. 4 cr.

705. MUSIC OF THE BAROQUE
Music of Europe from de Rore to Bach. 4 cr.

707. MUSIC OF THE CLASSICAL PERIOD
The growth of musical styles and forms from early classical, baroque-influenced composers through the high classicism of Haydn and Mozart, to the budding romanticism of the young Beethoven. Representative symphonies, concerti, and operas will be heard. 4 cr.

709. MUSIC OF THE ROMANTIC PERIOD
The symphonies, concerti, chamber music, and keyboard works of Beethoven, Berlioz, Schubert, Mendelssohn, Schumann, Brahms, Franck, Chopin, and Liszt. Romantic elements contained in the development of harmony, orchestration, sonority, expressive content. The rise of the short piano piece, the German art song, the symphonic poem, nationalism in music. 4 cr.

711. MUSIC OF THE 20th CENTURY
Contemporary music including its literature, its trends, and an analysis of techniques, styles, forms, and expression. 4 cr.

721. THE LIFE AND WORKS OF BEETHOVEN
The piano sonatas, concerti, symphonies, and string quartets. 4 cr.

732. THE ART SONG
The history and literature of the solo song with piano accompaniment. Survey of national styles of the 19th and 20th centuries and deeper study of the central core of the art song—the German Lied. 4 cr.

733. SURVEY OF OPERA
Representative masterpieces of this art form through listening, reading, and discussion. 4 cr.

735. SURVEY OF PIANOFORTE LITERATURE
Keyboard literature from Bach to the present. Discussion and performance of the works of Bach; the sonatas and concerti of Haydn, Mozart, Beethoven, Schubert, the romantic composers, and of contemporary writers. 4 cr.

795. SPECIAL STUDIES IN MUSIC LITERATURE
Presumes a sound musical background. Barring duplication of material, this course amy be repeated for credit. Prerequisite: permission of instructor. 1-4 cr.

Performance (MUSI)

Registration for musical organization courses should be completed during the registration period. All music laboratory courses may be repeated. A maximum of 8 credits earned in music laboratory may be used toward graduation.

Private lessons are based on half-hour individual instruction per week. One semester hour credit may be earned with one lesson per week; two or four semester hours of credit may be earned with two lessons per week (only students in the Bachelor of Music curriculum are allowed to register for four credits). Five one-hour practice periods are expected for each credit of private study. The special semester fee for lessons is $35 per half-hour lesson (this fee applies for courses numbered 541 through 550). The fee includes the use of a practice room for the required preparation.

Registration in courses of private instruction is open to all students in the University, subject to approval by the Music Department and instructor. Enrollment is limited in these courses. A student may register for credit in successive semesters.

441(441). CONCERT CHOIR—TECHNIQUES AND LITERATURE
Study and performance of the best classical and modern choral literature. Recommended for voice majors. Open to all interested students. Prerequisite: permission of instructor. 2 lab / 1 cr.

442(442). CHAMBER CHORUS
A mixed chorus which studies and performs sacred and secular works from the Renaissance to the present, participates with the opera workshop and with the orchestra, and serves as a nucleus for larger choral-instrumental work. Prerequisite: permission of instructor. 2 lab / 1 cr.

444(444). THE NEWHAMPSHIREMEN
The male chorus of the University. Recommended for all men voice majors. Prerequisite: permission of instructor and tryout. 2 lab / 1 cr. Cr. / F.

445. SUMMER SESSION CHORUS AND BASIC CONDUCTING
Study and performance of the best classical and modern choral literature. The basic elements of choral conducting for elementary and secondary teachers, church choir directors, and those interested in singing. May be repeated. 1 cr.

448(448). OPERA WORKSHOP
Operatic singing, acting, and production techniques; performance of both complete operas and operatic excerpts. Prerequisite: permission of instructor. 1 cr.

450(450). SYMPHONY—TECHNIQUES AND LITERATURE
Presents several concerts during the year of repertoire ranging from the great standard symphonic literature to experimental multi-media composition. Prerequisite: permission of conductor and individual audition. 2 lab / 1 cr.

451(451). UNH TRAINING ORCHESTRA
Designed for music education majors but open to all who wish to develop proficiency on major or secondary instruments. Ensemble experience in the basic repertoire often met in school situations for students who do not yet meet the standards required for the UNH Symphony. 1 lab / 1 cr.

452. UNH SYMPHONIC WIND ENSEMBLE
Open to all students. Campus concerts and New England tour. Prerequisite: permission of instructor and audition. 4 lab / 1 cr.

453. UNIVERSITY BAND
Original band music, transcriptions, marches, etc. For students whose program does not permit music as a major interest, but are interested in maintaining their playing proficiency and continuing their study of music. Prerequisite: permission of instructor. 2 lab / 1 cr.

454. UNH MARCHING BAND
Open to all students; performs during home and away football games. Rehearsals conclude at the end of the football season. Prerequisite: permission of instructor. Students planning to remain in the band program after football season should register for Mu. 452 or 453. 4 lab/0 cr.

455(455). PIANO ENSEMBLE—TECHNIQUES AND LITERATURE
Drawing from available student instrumentalists and singers, the pianist learns the art of performing in trios, duo sonatas, two-piano works, and gains experience in Lieder accompaniment.l cr.

456(456). STRING ENSEMBLE—TECHNIQUES AND LITERATURE
457(457). WOODWIND ENSEMBLE—TECHNIQUES AND LITERATURE
458(458). BRASS ENSEMBLE—TECHNIQUES AND LITERATURE
459(459). PERCUSSION ENSEMBLE—TECHIQUES AND LITERATURE
460(460). JAZZ ENSEMBLE—TECHNIQUES AND LITERATURE
In these five courses, groups of instrumentalists gain experience in the performance of literature for the smaller ensemble. Prerequisite: permission of instructor. 1 cr.

467(467). FUNCTIONAL PIANO
Basic instruction for music majors with no previous keyboard training. Pianoforte technique, keyboard harmony geared to the practical harmonization of simple melodies, sightreading, transposition and modulation. May involve both class instruction and periodic short individual lessons. May be repeated until the Music Education proficiency level is attained to a maximum of 4 cr. Prerequisite: permission of instructor.1 cr.

541(541). VOICE
542(542). PIANO
543(543). HARPSICHORD
544(544). ORGAN
545(545). VIOLIN,VIOLA
546(546). VIOLINCELLO, STRING BASS
547(547). WOODWIND
548(548). BRASS
549(549). PERCUSSION
550(550). HARP(Offered by special arrangement with the department.)
In courses 541 through 550 (private instruction in performance) presentation and material used vary with pupil. Emphasis on musical values and sound techique. As the student advances, repertory is broadened to include works of all periods. One solo performance each semester may be required. Prerequisite: permission of instructor. 1 or 2 lessons; 1, 2 or 4 cr.

551-552. CONDUCTING METHODS
Physical aspects, equipment of conductor, fundamental gestures and beats, baton techniques. The reading and analysis of full and condensed scores, study of transposition, psychology of rehearsal. Prerequisite: Mu. 571-572 and junior standing. 2 cr.

754(754). COLLEGIUM MUSICUM
Instrumentalists and singers perform small ensemble music from all periods, with emphasis on Renaissance and baroque music. Prerequisite: permission of instructor. 1 cr.

755(755). PERFORMANCE STUDIES IN MEDIEVAL MUSIC
Performance of vocal, vocal-instrumental, and instrumental ensemble, circa 1100 to 1450; rhythm, musica ficta, notation, melodic ornamentation, improvised polyphony, and the clear projection of a polyphonic texture. Evaluation of the writings of selected medieval theorists and modern scholars; practical exercises in transcription; and performance on reconstructions of medieval instruments, especially the organ, harp, psaltery, rebec, vielle, and recorder. 2 or 4 cr.

756(756). PERFORMANCE STUDIES IN RENAISSANCE MUSIC
Problems of musical performance, circa 1450 to 1600, via the small vocal, vocal-instrumental, and instrumental ensemble; rhythm and tempo, musica ficta, text underlay, articulation, diminution, tablature notation, and effective distribution of voices and instruments. Survey of performance manuals, iconographical sources, and current research; development of editing technique through the preparation of transcriptions; and an opportunity to perform on the organ, harpsichord, lute, viols, recorders, cornets, and trombones. 2 or 4 cr.

757(757). PERFORMANCE STUDIES IN BAROQUE MUSIC
Performance practices in solo keyboard works, sonatas, a 2 and a 3 and solo cantatas, circa 1640 to 1750, concentrating on ornamentation, realization of figured basses, improvisation, articulation, rhythm, keyboard registration, and the influence of the construction of baroque musical instruments (including the organ) on sonority and technique. Course work includes an examination of manuscripts (on microfilm), prints, treatises, and inconographical sources and the editing and realization of selected works for recital performance. 2 or 4 cr.

758(758). PERFORMANCE STUDIES IN CLASSICAL MUSIC
Performance of keyboard music and instrumental chamber music, circa 1760 to 1815, emphasizing the relationship between structure and interpretation, late 18th century conventions of ornamentation and articulation, a survey of tutors and relevant theoretical writing, and a critique of currently published editions and editing techniques. 2 or 4 cr.

759(759). PERFORMANCE STUDIES IN 19th CENTURY MUSIC
Performing and coaching Lieder, piano music, and instrumental chamber music from Schubert through Debussy; effective ensemble, traditions of interpretation, and the influence of structure on performance. 2 or 4 cr.

760(760). PERFORMANCE STUDIES IN 20th CENTURY MUSIC
Small instrumental or vocal-instrumental ensembles, with intensive work in structural analysis, rhythmic ensemble coordination, dynamic and articulation control, new instrumental techniques, notation, improvisation, and the interaction between jazz and European styles. 2 or 4 cr.

Theory and Composition

471-472. THEORY I
Introduction to the tonal system: principles of voice-leading and harmonic progression through the analysis, realization, and composition of one-, two-, and four-voiced textures. The concept of triad inversion and consonant diatonic harmonies of the major and minor modes. Students should register for 473-474 concurrently. Prerequisite: permission of instructor. 3 rec/3 cr.

473-474. EAR TRAINING I
Laboratory exercises to develop aural skills; sight-singing and dictation. Students should register for Mu. 471-472 concurrently. Prerequisite:permission of instructor. 2 lab/1 cr.

571-572. THEORY II
A continuation of Mu. 471-472. Compositional and analytic work stresses the treatment of dissonance within the tonal system; accessory tones, seventh chords, tonicization, modulation, the basic principles of chromatic harmony, and the harmonization of chorale melodies are covered. Students should register for 573-574 concurrently. Prerequisite: Mu 472, 474, and permission of instructor. 3 rec/3 cr.

573-574. EAR TRAINING II
Laboratory exercises to further develop aural skills. Students should register for Mu. 571-572 concurrently. Prerequisite: Mu.472,474, permission of instructor. 2 lab/1 cr.

771-772. COUNTERPOINT
Contrapuntal techniques of tonal music. Melodic construction and dissonance treatment through work in species counterpoint and studies in harmonic elaboration and prolongation. Analysis of selected compositions emphasizes the connection between fundamental contrapuntal techniques and the voice-leading of composition. Prerequisite: Mu. 572 or permission of instructor. 2 cr.

773. CANON AND FUGUE
A continuation of Mu. 772. The procedures of polyphonic tonal textures through the analysis and composition of canons and fugues.Prerequisite: Mu.772 or permission of instructor. 2 cr.

775-776. COMPOSITION
Construction of phrases, periods, and short compositions following classical models. Problems of text-setting. Prerequisite:Mu.572 or permission of instructor. 3 cr.

777-778. ADVANCED COMPOSITION
A continuation of Mu. 776. Individual compositional projects. Prerequisite:Mu.776 and permission of instructor. 3 cr.

779. ORCHESTRATION
The characteristics of band and orchestral instruments both individually and in small (homogeneous) and large (mixed) groupings. Students study scores, write arrangements, and have arrangements performed if at all possible. Some aspects of vocal writing. Prerequisite: Mu. 572 or permission of instructor. 4 cr.

781. FORM AND ANALYSIS
Formal and textural elements; concepts and examples. Thorough analysis of smaller and larger masterworks from the standpoint of harmony, counterpoint, structural line, and formal articulation. Prerequisite: Mu. 572 or permission of instructor. 4 cr.

785. ELECTRONIC SOUND SYNTHESIS
Part I: "traditional" or "analog" electronic sound synthesis; work with the Buchia Synthesizer in the electronic music studio. Part II: 1) elementary programming in FORTRAN, 2) the logic of computer sound synthesis, and 3) programming in MUSIC 4BF. Students will have the opportunity to run programs on a DEC KI10 computer equipped with 4-channel digital-to-analog and analog-to-digital converters. Part III: completion of a major independent study project in electronic music. Prerequisite: permission of instructor. 4 cr.

Music Education (MUED)

500. EXPLORING MUSIC TEACHING
Introductory field-work course for students to explore music teaching as a career. Observation, teaching, research, examination of multi-mechanical aids for music curriculum development. 2 cr.

540. BEGINNING TECHNIQUES IN VOICE
Basic techniques of voice production. Individual work is emphasized. A working knowledge of an instrument is required. This course is desirable for but not restricted to Music Education majors. Prerequisite: permission of instructor. 2 cr.

545,546. BEGINNING TECHNIQUES IN STRING INSTRUMENTS
Class and individual instruction. Four hours practice per week. Training on the violin, viola, and cello. Classroom procedures, establishment of string programs, and evaluation of available methods materials. 2 cr.

595. SPECIAL PROJECTS IN MUSIC EDUCATION
Individual investigation, research, or study. Creative projects may be included. Prerequisite:permission of instructor.1-4cr.

741-742. TECHNIQUES AND METHODS IN CHORAL MUSIC
Problems in the organization and performance of high school, college, and community choruses. Techniques of choral conducting and rehearsal, repertory, and materials. 2 cr.

743. MATERIALS AND METHODS IN PIANO MUSIC
Gives potential piano teachers a coherent but flexible approach to the instruction of students of different ages and levels of talent through evaluation of methods and materials and discussion of the role of the private teacher.2 cr.

745-746. TECHNIQUES AND METHODS IN STRING INSTRUMENTS
Class and individual instruction. Four hours practice per week required. Intensive training on the violin, viola, cello, and double bass, enables participants to perform in string ensembles. Classroom procedures, establishment of string programs, and evaluation of available methods materials.2 cr.

747-748. TECHNIQUES AND METHODS IN WOODWIND INSTRUMENTS
Basic fundamentals of performance, class instruction, associated acoustical problems and study of woodwind literature. First semester: clarinet, flute, and saxophone. Second semester:double-reed instruments.2 cr.

749(749). TECHNIQUES AND METHODS IN BRASS INSTRUMENTS
A basic course in enbouchure formation, tone, tonguing, fingering, flexibility, accuracy, and range development as applied to the trumpet or baritone horn, French horn, and trombone; methods, studies, solos, and ensembles most likely to be useful with grade school, junior high school, and high school players of brass instruments. Qualified advanced students may elect honors work in composition, arranging, and ensemble coaching.2 cr.

751. TECHNIQUES AND METHODS IN PERCUSSION INSTRUMENTS
Basic performance skills on snare drum, timpani, mallet instruments and other percussion instruments used in bands and orchestras. Materials and methods of instruction.2 cr.

785. MUSIC FOR THE ELEMENTARY CLASSROOM TEACHER
Designed for the non-specialist. The correlation and integration of music in the school curriculum, and the basic skills and techniques necessary.4 cr.

787-788. THE TEACHING OF ELEMENTARY AND MIDDLE SCHOOL MUSIC
Aims, scope, and organization of materials and activities in the elementary and middle schools. Modern trends in educational philosophy; development of the child's voice; demonstration of materials and methods for the various grades. Observation and teaching in schools.2 cr.

791-792. THE TEACHING OF SECONDARY SCHOOL MUSIC
Educational principles applied to music teaching and learning; curriculum organization for junior and senior high school. Adolescent voice, voice classification, selection of vocal and instrumental materials, and building unified concert programs. Problems of administration; management; relationship of the teacher to school and community. Observation of secondary school music programs.2 cr.

795. SPECIAL STUDIES IN MUSIC EDUCATION
Allows upper-level students to explore individually or in groups areas related to their specific professional interests. Prerequisite:permission of instructor.1-4 cr.

796. ORGANIZATION AND ADMINISTRATION OF SCHOOL MUSIC GROUPS
Problems of organizing and administering school orchestras, bands, glee clubs, choruses, and small ensembles; objectives, motivation, schedule, discipline, equipment, programs, finances, rehearsal techniques, contests and festivals, materials, personnel selection, and grades.4 cr.

Nursing (NURS)

Acting Chairperson: Marguerite F. Fogg

ASSOCIATE PROFESSORS: Mary L. Fernald, emerita; Marguerite Fogg, Ann Kelley, Lorraine Phillips, Rosemary Wang
ASSISTANT PROFESSORS: Joyce Barker, Dolores Bowers, Patricia Dean, Meigs Dickman, Sarah Hubbard, Juliette Petillo, Martha Rowe
INSTRUCTORS: Susan Collins, Evelyn Fitzpatrick, Margaret Rice, Judith Rick
LECTURERS: Ann Haskell, Debra Livingston

402. NURSING
Current trends and issues in nursing. Personal beliefs and understandings related to practice and nursing. Significance of interpersonal and technical skills in nursing practice. Nu. majors only. 2 lec/2 cr.

601. NURSING PROCESS
Concepts and theories related to nursing process applied to man—a bio-psycho-social being. Laboratory experiences: application of process to well individuals throughout the life cycle; focus on maintaining health in the community setting. Prerequisite: junior standing; Nu. majors. 4 lec/4 lab/6 cr.

603. NURSING PROCESS APPLIED TO WELL FAMILY
Nursing process applied to well families; maintaining family health under normal stresses and adaptation to change. Laboratory experience: health maintenance of an assigned well family and an expanding family. Prerequisite: junior standing; Nu. major. 4 lec/4 lab/6 cr.

610. NURSING PROCESS DEALING WITH ENVIRONMENTAL INFLUENCES ON MAN AND NURSING
Health care delivery system as it relates to limited illness, leadership, change, and research. Nursing interventions with clients experiencing injuries from mechanical, thermal, chemical, and occupational stress. Laboratory experiences in hospitals and communities. Prerequisite: Nu. 601 and 603; Nu majors. 3 lec/6 lab/6 cr.

612. NURSING PROCESS IN LIMITED DISRUPTIONS OF MAN'S WELLNESS
Nursing process applied to individuals and families coping with surgical, inflammatory, and childbearing stresses; maintenance of the transport system, internal chemical environment, and comfort. Laboratory experiences in hospitals and the community to increase understanding and proficiency. Prerequisite: Nu. 601 and 603; Nu. majors. 3 lec/6 lab/6 cr.

621. NURSING PROCESS IN COMPLEX DISRUPTIONS OF MAN'S WELLNESS
Nursing process applied to complex biopsycho-social disruptions and/or life threatening situations in man's wellness at all developmental levels. Prerequisite: Nu. 610 and 612; Nu. major. 3 lec/6 lab/6 cr.

625. NURSING PROCESS DEALING WITH COMPLEX ENVIRONMENTAL INFLUENCES ON MAN AND NURSING
Nursing process applied to complex external stimuli affecting man and nursing; multiple environmental and societal factors contributing to disruptions in man's wellness. Prerequisite: Nu. 610 and 612; Nu. major. 3 lec/6 lab/6 cr.

628. NURSING PROCESS IN MAINTAINING MAN'S OPTIMUM FUNCTION IN SOCIETY
Nursing process; collaboration and coordination within the health team to assess and promote functional health potential of individuals at all developmental stages. Prerequisite: Nu. 621 and 625; Nu. major. 4 lec/8 lab/8 cr.

695(695). INDEPENDENT STUDY
In-depth study with faculty supervision. Prerequisite: junior standing and approval of adviser and faculty of the area concerned. 2-4 cr.

Occupational Education (OCED)

Chairperson: William H. Annis

PROFESSORS: Samuel Hoitt, emeritus; William H. Annis, Maynard Heckel
ASSOCIATE PROFESSOR: Jesse James, emeritus; Richard L. Barker
ASSISTANT PROFESSOR: Nicholas L. Paul
THOMPSON SCHOOL PROFESSOR: Paul A. Gilman
THOMPSON SCHOOL ASSOCIATE PROFESSOR: Lewis Roberts, Jr.

402. FABRICATION TECHNOLOGY
Welding, cold-metal working, sheet-metal working, wood working, and plastics in relation to building or repair of structures and machines. Prerequisite: permission of instructor. 2 rec/2 lab/4 cr.

500. OCCUPATIONAL COMPETENCY EXAMINATION AND EVALUATION
Examination and/or evaluation to determine the level of competency within occupational clusters. Restricted to Oc.Ed. majors. Prerequisite: permission of instructor. 0-30 cr.

550. PRINCIPLES OF OCCUPATIONAL EDUCATION
Technical and professional qualification of Oc.Ed. teachers and the Cooperative Extension Service. Federal and state legislation affecting these programs at the local level. 4 cr.

650. MICRO-TEACHING
Organization and presentation of micro-lessons; preliminary experience and practice in teaching. Variables of classroom teaching under controlled conditions. Substitutes for Education 703. Video taping for immediate feedback. Required for majors and minors in Oc.Ed. Prerequisite: Education 500 or permission of instructor. 1-4 cr.

695. INVESTIGATIONS IN OCCUPATIONAL EDUCATION
1) Career Education, 2) Secondary Education, 3) Post Secondary Education, 4) Adult Education, 5) Extension Education, 6) Exemplary Education, 7) Cooperative Education, 8) Disadvantaged and Handicapped Education. An opportutnity for undergraduates to address a special problem. Prerequisite: permission of instructor. May be repeated. 2-4 cr.

696. FIELD EXPERIENCE
Work with an agency, institution, or organization to gain technical and/or professional competence not otherwise available. Student plans experience with departmental adviser. Credit approval subject to recommendation of faculty members, and performance of student. Limited to Oc.Ed. majors and minors. Prerequisite: permission of instructor. May be repeated up to 16 credits. 2-16 cr.

700. WORKSHOPS IN OCCUPATIONAL EDUCATION
Modularized instruction for inservice education of teachers of Vocational Education and others in Occupational Education. May be repeated up to 8 credits. 1-2 cr.

750. SHOP ORGANIZATION AND CONTROL METHODS
Efficiency in the control of instruction, equipment, and materials. 4 cr.

783. PREPARATION FOR CONDUCTING AND SUPERVISING ADULT-EDUCATION PROGRAMS
Techniques of needs identification, program planning, teaching methods, supervision, and evaluation. Prerequisite: Oc.Ed. 550 or permission of instructor. 4 cr.

784. THE COMMUNITY-JUNIOR AND VOCATIONAL-TECHNICAL COLLEGES
Rise and development of community-junior colleges and two-year vocational-technical colleges in American education; their history, potential, philosophy , and functions. 4 cr.

785. ADVANCED METHODS AND MATERIALS OF INSTRUCTION
Organization of instruction to meet student needs; development and use of resource files and instructional materials; evaluation. Open to teachers of vocational-technical education and others by permission of instructor. 4 cr.

786. CONCEPTS OF OCCUPATIONAL EDUCATION
Development of vocational-technical education in the U.S.; socioeconomic influences responsible for its establishment. Federal and state requirements for secondary and post-secondary schools. Coordination of programs with general education and other vocational fields. 4 cr.

787. ADMINISTRATION AND SUPERVISON OF VOCATIONAL EDUCATION
Special competencies required and operating philosophies examined for supervision and administration in the several areas of vocational education. 4 cr.

791. PLANNING FOR TEACHING
Organization of materials of instruction to meet group and individual needs. Techniques of instruction, planning for teaching, the function of consulting committees, working with youth groups, program evaluation. Course is scheduled concurrently with Education 694. Prerequisite: OC.Ed. 650. 4 cr.

796. INVESTIGATIONS IN OCCUPATIONAL EDUCATION
1) Career Education, 2) Secondary Education, 3) Post Secondary Education, 4) Adult Education, 5) Extension Education, 6) Exemplary Programs, 7) Cooperative Education Programs, 8) Disadvantaged and Handicapped Education Programs. Student-selected problems in one of the areas listed. Elective after consultation with the instructor. Hours to be arranged. May be repeated. 2-4 cr.

798. OCCUPATIONAL EDUCATION SEMINAR
Discussion of current issues, problems, and research and development in Oc.Ed. Students, faculty, and other personnel serve as discussion leaders. Required of Oc.Ed. majors and minors. 0 cr.

Occupational Therapy (OT)

Chairperson: Ann D. Ury

ASSOCIATE PROFESSORS: R. Virginia Bell, Ann D. Ury
ASSISTANT PROFESSORS: Marjorie B. Dussault, Ruth Heider
INSTRUCTOR: Judith Ward
PRE-CLINICAL INSTRUCTORS: Elizabeth Crepeau, Elsilyn B. Miller
LECTURER: Barbara Peterson
SUPERVISOR OF FIELD WORK EXPERIENCE: Ruth Heider
MEDICAL LECTURERS: Luigi N. Dolcino, M.D., Charles H. Howarth, M.D., John C. Neff, M.D., Gerald Shattuck, M.D., Paul C. Young, M.D.

The following courses are for occupational therapy students; elective for others by permission of the department chairperson.

(400). PRE-CLINICAL IN NORMAL CHILD DEVELOPMENT
Assignment to local facilities for observation and work with normal children. Scheduled discussions of experiences and appropriate written reports. Prerequisite: permission of the instructor. 1 cr. Cr/F.

510. OCCUPATIONAL THERAPY—THEORY I
Developmental concepts and historical perspectives of the basic theories and techniques. Fundamentals of evaluation, testing, and problem solving; planning and administering treatment. Clinical observation and supervised clinical participation. Prerequisite: O.T.400. 3lec/1 lab/4 cr.

512. TREATMENT MEDIA ANALYSIS I
Activity and its relationship to normal human development; teaching and supervising activities programs. Development of skills in treatment media and administration of activity programs. Minimum lab fee: $5. Prerequisite: O.T. major or permission of instructor. 2 lab/2 cr.

515. TREATMENT MEDIA ANALYSIS II
Analysis of life tasks and human needs with an introduction to therapeutic analysis. Media explored for skill development and adaptation to treatment. Minimum laboratory fee: $12. Prerequisite: junior standing in O.T. major. 3 lab/4 cr.

531(531). GROUP PROCESS
Dynamics and development of group relationships with emphasis on self-awareness and sensitivity to others. Comparison of normal and therapeutic groups. Group processes in practice; role development and leadership concepts. 2 rec / 2 cr.

581. INTRODUCTION TO MEDICAL CONCEPTS
Basic concepts of disease and disease process; emphasis on identification of factors relevant to O.T. problem-solving. Medical lecturers as appropriate. Prerequisite: O.T. 510, 512; Zoology 507-508; and junior standing in the major. 4 cr.

582. OCCUPATIONAL THERAPY THEORY II—DEVELOPMENTAL CONCEPTS AND REHABILITATION
Functional disabilities in a medical-model framework in relation to the developmental tasks from pediatric through geriatric age groups. Specific O.T. treatment goals discussed and practiced in the laboratory. Medical lectures as appropriate. Prerequisite: Physical Education 652, O.T. 581, and junior standing in the major. 4 cr.

583(583). OCCUPATIONAL THERAPY—PSYCHIATRIC FOUNDATIONS
Clinical psychiatric conditions presented by a psychiatrist through patient interviews. Recognition of pathological psychiatric symptoms, their cause, and general treatment are emphasized in follow-up recitation sections. Prerequisite: junior standing in O.T. major or permission of instructor. 4 cr.

588. PRE-CLINICAL II—THREE ONE-WEEK PRE-CLINICALS
During sophomore, junior, and senior years the student is required to spend three weeks in a clinical setting in school breaks or summers. Written evaluation is required for each. Prerequisite: admission to O.T. program and permission of the instructor. 1 cr. Cr / F.

(624)624. OCCUPATIONAL THERAPY—THEORY III—PSYCHO SOCIAL TREATMENT
Psychiatry applied to psycho-socially disabled patients. Learning theory, group dynamics, treatment, evaluation, and rehabilitation techniques. Application of theory in a clinic setting. Prerequisite: O.T. 583. 4 cr.

633. OCCUPATIONAL THERAPY—THEORY IV—PHYSICAL DYSFUNCTION
Selected orthopedic and rehabilitation medicine problems with concurrent study of applicable O.T. Rx techniques; fractures, amputations, arthritis, burns, and other orthopedic conditions. Medical lectures as appropriate. Prerequistie: senior standing in the major. 4 cr.

634. OCCUPATIONAL THERAPY—THEORY IV—ADVANCED PHYSICAL DYSFUNCTION
O.T. treatment-planning with neurological and sensory motor disabilities (re: spinal cord injuries, cerebral palsy, learning disabilities). Concepts of community practice. Appropriate medical lectures. Prerequisite: Physical Education 606 and O.T. 633. 4 cr.

644. INTRODUCTION TO EVALUATION AND OCCUPATIONAL THERAPY TREATMENT PLANNING FOR LEARNING DISABILITIES
Defining learning disability problems. Diagnostic tools for determining impairments in visual perception, perceptual-motor areas, and the auditory language area. Remediation programs. Prerequisite: senior standing in the major or permission of instructor. 4 cr.

695(695). INDEPENDENT STUDY
In-depth study with faculty supervision. Prerequisite: junior standing in O.T. major, approval of the major adviser, and the faculty of the area concerned. 2-4 cr.

697. ORGANIZATION AND ADMINISTRATION
Organization and administration of O.T. services. Practical problem-solving experiences. Development of fundamental research skills. Prerequisite: senior standing in the major. Staff. 2 cr.

698. SENIOR SEMINAR
Current professional issues. Independent work under a faculty adviser culminating in a senior project. Prerequisite: senior standing in the major. Staff. 2 cr.

781. MEDICAL ASPECTS OF REHABILITATION
Physicians present basic, practical medical knowledge and the effects of physical and mental illness on interpersonal relationships and work capacity. Major diseases and impairments which result in functional and vocational disability; medical terminology associated with them. Prerequisite: Ed. 818 or the equivalent and permission of instructor. 4 cr.

Ocean Engineering

See Interdisciplinary and Experimental Programs, page 85.

Oceanography

See Interdisciplinary and Experimental Programs, page 84.

Philosophy (PHIL)

Chairperson: Asher Moore

PROFESSORS: Donald C. Babcock, emeritus; Asher Moore
ASSOCIATE PROFESSORS: Paul Brockelman, Robert C. Scharff, Duane Whittier
ASSISTANT PROFESSORS: R. V. Dusek, Neil Lubow, Yutaka Yamamoto
INSTRUCTOR: James Stephens
LECTURER: Judith St.Lawrence

Introduction to Philosophy: The 400-level courses listed below are all introductions to philosophy; students should select from among them according to interest. May be taken in any number and order; except for 495 and 496 there are no prerequisites.

401(401). PHILOSOPHICAL DIMENSIONS
An examination of representative philosophies and some of the persistent problems of philosophy. An introductory course designed to acquaint students with the nature of philosophy and to help them think about experience philosophically. 4 cr.

(412)412. LOGIC, LANGUAGE, AND SCIENTIFIC METHOD
Principles of good reasoning: the nature of language, the logical structure of arguments, and the nature of scientific inquiry. 4 cr.

417(417). PHILOSOPHICAL REFLECTIONS ON RELIGON
Introductory philosophy of religion. To help students become critically aware of the philosophical issues involved in various forms of religious belief and some of the persisting philosophical understandings of those issues. 4 cr.

421(421). PHILOSOPHY AND THE ARTS
Contemporary philosophic concerns and perspectives as relected in one or more of the arts (literature, theater, film, music, plastic art). 4 cr.

(424)424. SCIENCE, TECHNOLOGY, AND SOCIETY
Consideration of the scientific endeavor and its social import from a philosophical perspective. 4 cr.

(430)430. SOCIETY AND MORALS
A critical study of principles and arguments advanced in discussion of current moral and social issues. Possible topics: violence, rules of warfare, sexual morality, human rights, punishment, abortion. 4 cr.

435(435). MAN AND WORLD
An introductory investigation of man and his world from a variety of philosophical perspectives. 4 cr.

475(475). PHILOSOPHICAL REFLECTIONS ON EDUCATION
Philosophical study of the nature, significance, and place of education within the human condition. Students begin to work out and articulate their own attitudes toward the basic issues which lie at the heart of education at all levels. 4 cr.

495(495). TUTORIAL READING
Reading under faculty direction. The books offered for tutorial reading may be in any area the instructor chooses or on an independent study basis. Prerequisite: permission of instructor. Variable to 4 cr.

(496)496. PHILOSOPHIC TOPICS
Introductory-level seminar in specific topics or problems (e.g. death, love, friendship) considered from a philosophic point of view. Permission required. 4 cr.

(520)520. INTRODUCTION TO EASTERN PHILOSOPHY
Major Eastern traditions of philosophy. Concentration on Indian, Chinese, and Japanese systems may vary from semester to semester. Not open to freshmen. 4 cr.

(530). ETHICAL THEORIES
A critical review of developments in ethical and value theory with emphasis on normative ethical theories. 4 cr.

550. SYMBOLIC LOGIC
The principles and techniques of modern logic, with special attention to their philosophical significance. Sentential calculus, class calculus, truth tables, and lower functional calculus; the nature of deductive systems and the problems of formal consistency. 4 cr.

(570)570. ANCIENT PHILOSOPHY
Development of Western philosophy from its beginnings in Greece to the Roman period, with particular emphasis on the thought of Plato and Aristotle.4 cr.

(571). MEDIEVAL PHILOSOPHY
Philosophical thought of the Middle Ages from inception in the late Roman period with thinkers such as Plotinus and Augustine through the late Medieval speculative mysticism of such figures as Meister Eckhart. Writings of Augustine and Thomas Aquinas. 4 cr.

572. MODERN PHILOSOPHY: RATIONALISM
Continental European philosophers of the 17th and 18th centuries including Descartes, Leibnitz, Spinoza, and Kant. 4 cr.

573. MODERN PHILOSOPHY: EMPIRICISM
British empiricists of the 17th and 18th centuries; e.g. Locke, Berkeley, and Hume; perhaps concluding with Kant's reaction to empiricism. 4 cr.

(574). 19th CENTURY PHILOSOPHY
Important 19th century philosophical movements such as German Idealism, French Positivism, Utilitarianism, Pragmatism, Marxism, Existentialism, and Vitalism. Prerequisite: Phil. 572 and/or 573. 4 cr.

(600) 600. PHILOSOPHY THROUGH LITERATURE
The philosophical implications of representative literary works; emphasis on recent and contemporary literature. Prerequisite: junior or senior standing. 4 cr.

(610). SURVEY OF RECENT AMERICAN PHILOSOPHY
Philosophical movements such as Pragmatism and Process Philosophy. Readings from figures such as Peirce, James, Dewey, Santayana, Whitehead, and C.I. Lewis. Prerequisite: two courses in the history of philosophy (one of which may be concurrent) or permission of the instructor. 4 cr.

(615). SURVEY OF RECENT ANALYTIC PHILOSOPHY
Development of Analytic Philosophy from 1900 to the present day. The Analytic method applied to the solution of philosophic problems. Typical readings: Russell, Moore, Wittgenstein, Ayer, Ryle, and Austin. Prerequisite: two courses in the history of philosophy (one of which may be concurrent) or permission of the instructor. 4 cr.

(620). SURVEY OF RECENT EUROPEAN PHILOSOPHY
Major developments and themes. Representative figures; Jaspers, Husserl, Heiddegger, Bloch, Lukacs, Habermas, Bergson, Marcel, Sartre, Merleau-Ponty, Ricoeur, Kolakowski, etc. Prerequisite: two courses in the history of philosophy (one of which may be concurrent) or permission of the instructor. 4 cr.

630. PHILOSOPHY OF THE NATURAL SCIENCES
Philosophical problems raised by the physical and biological sciences; role of mathematics in science, nature of scientific concepts of space and time, relations of science to common sense, relation of theory to observation, logic of scientific discovery, nature of historical changes in scientific world-view, relation of the logic of science to the psychology and history of science. 4 cr.

(635). PHILOSOPHY OF LAW
Systematic study of the salient features of legal systems. Possible topics: nature of law; concept of legal validity; law and morality; individual liberty and the law; legal punishment; legal responsibility and related concepts (for example, legal cause, harm, *mens rea*, negligence, strict liability, legal insanity). 4 cr.

695,696. SENIOR HONORS
Tutorial work for philosophy department "honors candidates." Prerequisite: two courses in the history of philosophy, senior standing, and acceptance to honors candidacy. 4 cr.

(710) 710. PHILOSOPHY OF RELIGION
The philosophic nature and significance of religious experience; historical and systematic analysis of such traditional issues as the nature of faith, the relation of faith to reason, arguments concerning the existence and nature of God, the problem of evil, the relationship of religion and morality, and the relationship of religion and science. Prerequisite: two courses in the history of philosophy or permission of the instructor. 4 cr.

(712). ADVANCED LOGIC
A selection from: consistency and completeness of the predicate calculus; second-order logic; modal logic; axiomatic set theory; formalized arithmetic; recursive functions and Gödel's proof; Turing machines; formal semantics. Prerequisite: either Phil. 550, Math 531, or permission of the instructor. 4 cr.

715 (715). ETHICS
Problems in ethical theory. Topics may include the utilitarian-deontologist dispute, the analysis of moral language, the problem of justification, and the various conceptions of morality. Prerequisite: Philosophy 530 or permission of the instructor. 4 cr.

(720) 720. PHILOSOPHICAL PSYCHOLOGY
Philosophical perspectives and problems concerning human nature or the human condition; e.g. the nature of "self," human action, the body-mind problem, freedom of the will, the meaning of "person," the nature of behavior, etc. Prerequisite: two courses in the history of philosophy or permission of the instructor. 4 cr.

725(725). PHILOSOPHY OF THE SOCIAL SCIENCES
The nature of explanation and understanding in the social sciences. Similarities and differences between the social and physical sciences; the claims of objectivity and subjectivity in the social sciences; the role of values in the social sciences. Prerequisite: two courses in the history of philosophy or permission of the instructor. 4 cr.

735(735). SOCIAL AND POLITICAL PHILOSOPHY
Important concepts in social and political philosophy such as natural rights, revolution, law, freedom, justice. Variable content. Prerequisite: two courses in the history of philosophy or permission of the instructor. 4 cr.

(740)740. AESTHETICS
Philosophic inquiry into art and beauty. Prerequisite: two courses in the history of philosophy or permission of the instructor. 4 cr.

745(745). PHILOSOPHY OF LANGUAGE
Contemporary philosophical studies of the nature of meaning and the stucture of language. Prerequisite: two courses in the history of philosophy or permission of the instructor. 4 cr.

(750)750. PHILOSOPHY OF HISTORY
The nature of historical knowledge; efforts to discover patterns of meaning in the past. Prerequisite: two courses in the history of philosophy or permission of the instructor. 4 cr.

755(755). METAPHYSICS
Advanced and detailed study of one or more important questions or schools of metaphysics, e.g., the nature of being, the nature of reality, the relationship of thought and reality. Prerequisite: two courses in the history of philosophy or permission of the instructor. 4 cr.

(760)760. EPISTEMOLOGY
The theory of knowledge; nature of knowledge and belief; nature of perception; theories of truth. Prerequisite: two courses in the history of philosophy or permission of the instructor. 4 cr.

(780)780. SPECIAL TOPICS IN PHILOSOPHY
Advanced study of special topics: e.g., a problem, figure, or movement in the history of philosophy; or selected issues, thinkers or developments in contemporary philosophy. Prerequisite: two courses in the history of philosophy or permission of the instructor. 4 cr.

795,796. INDEPENDENT STUDY
For students who are adequately prepared to do independent, advanced philosophical work; extensive reading and writing. Before registering, student must formulate a project and secure the consent of a department member who will supervise the work. Conferences and/or written work as required by the supervisor. Variable cr.

Physical Education (PHED)

Chairperson: Robert Kertzer

PROFESSORS: Marion C. Beckwith, Evelyn Browne
ASSOCIATE PROFESSORS: Caroline Wooster, emerita; Katherine Amsden, Gavin H. Carter, Phyllis A. Hoff, Robert Kertzer, Robert E. Wear, Walter E. Weiland
ASSISTANT PROFESSORS: Thomas R. Barstow, Gail A. Bigglestone, Karen Hogarth, Daniel W. Jones, Jr., Joyce Mills, Nancy C. Rupp, D. Allan Waterfield
LECTURERS: Louis A. Datilio, Jean M. Rilling

Faculty from the Department of Intercollegiate Athletics
PROFESSOR: Paul C. Sweet, emeritus
ASSISTANT PROFESSORS: Dwight E. Aultman, Lionel J. Carbonneau, Theodore W. Connor, Irvin T. Hess
LECTURERS: M. William Bowes, John Copeland, Joseph J. Coppola, Gerald J. Friel, Charles Holt, Robert C. Norton, J. David O'Connor, Dwight Peters, Stephen P. Stetson, Arthur Young

The Major Program
Prospective physical education majors should refer to page 71 for information regarding the major programs.

The Elective Program
The Department of Physical Education provides an opportunity for students to participate in an elective activity program in a wide variety of sports, aquatics, conditioning, and gymnastics courses. A student may elect up to two credits of activity coursework per semester. Courses offered in the fall, winter I, winter II, and spring seasons include: aquatics (basic instruction, advanced lifesaving, water safety instructor, synchronized swimming, and SCUBA), archery, badminton, bowling, figure control, figure skating, fitness laboratory, foil fencing, basic skating, golf, gymnastics, handball, hiking / orienteering, ice hockey, outdoor education, paddleball, riflery, skiing, ski conditioning, ski touring, squash, tennis, trampoline, volleyball, weight training, yoga.

The Department supplies special uniforms. Students are required to furnish such items as sneakers and bathing caps. A $35 fee is charged for SCUBA; fees are also charged for off-campus activities such as skiing. Students with physical limitations are encouraged to participate in the program on a modified basis. Students may repeat the same level activity for credit with the instructor's approval.

Women's Intercollegiate Sports Program

The purpose of the Women's Intercollegiate Sports Program is to provide all students, whatever their ability, with the exception of the rank beginner, with the opportunity to practice and/or play in a competitive program designed to provide a representative team to compete against other colleges or universities.

A variety of individual and team sports experiences is provided in the eight representative teams: fall—tennis, field hockey, and volleyball; winter—skiing, basketball, swimming, and gymnastics; and spring—lacrosse.

Elective Physical Education

410-455. ELECTIVE PHYSICAL EDUCATION

Activity coursework open to all undergraduate students. Cr/F.

Half-Semester Courses (.5 credits each)

(410)410. ARCHERY
411(411). FIGURE SKATING—BEGINNING
(412)412. FIGURE SKATING—ELEMENTARY/INTERMEDIATE
413(413). FITNESS LAB—BICYCLING
(414)414. BASIC SKATING
415(415). GOLF—BEGINNING
(416)416. GOLF—INTERMEDIATE
417(417). ICE HOCKEY
(418)418. SKI CONDITIONING
(419). SKIING—BEGINNING*
420. SKIING—BEGINNING†
(421). SKIING—INTERMEDIATE†
422. SKIING—ADVANCED†
(423). SKIING—RACING†
424. SKI TOURING—BEGINNING
425(425). TENNIS—BEGINNING
(426)426. TENNIS—ELEMENTARY
427(427). TENNIS—INTERMEDIATE
(428)428. TENNIS—ADVANCED
429(429). SPECIAL TOPIC
(430)430. SPECIAL TOPIC
432. SKI TOURING—INTERMEDIATE
436. BOWLING
433. OUTDOOR EDUCATION
444. RIFLERY

Full Semester Courses (1 credit each)

435(435). BADMINTON
437(437). COURT GAMES (HANDBALL, PADDLEBALL, SQUASH)
(438)438. FENCING—BEGINNING
439(439). FENCING—ELEMENTARY
(440)440. FIGURE CONTROL
441(441). GYMNASTICS
(442)442. HIKING/ORIENTEERING
445(445). SCUBA—BEGINNING
(446)446. SCUBA—ADVANCED
447(447). ADVANCED LIFESAVING
(448)448. SWIMMING—BASIC
449(449). SYNCHRONIZED SWIMMING
(450)450. TRAMPOLINE
451(451). VOLLEYBALL
(452)452. WEIGHT TRAINING AND CONDITIONING
453(453). YOGA
(454)454. SPECIAL TOPIC
455(455). SPECIAL TOPIC

Specialized Physical Education Coursework for Majors

470-491. MAJOR ACTIVITY COURSEWORK

Performance skills and beginning teaching methods.

470. GYMNASTICS 1 cr.

472. EDUCATIONAL GYMNASTICS 1 cr.

Gymnastics in Movement Education emphasizing the problem-solving method of teaching.

473. TRACK & FIELD 1 cr.
474. FOLK, SQUARE, & SOCIAL DANCE .5 cr.
475. CONDITIONING .5 cr.
476. VOLLEYBALL .5 cr.
477. TENNIS .5 cr.
478. LEAD-UP GAMES .5 cr.
479. ACTIVITIES FOR ELEMENTARY SCHOOL .5 cr.
480. WRESTLING .5 cr.
481. MEN'S SOCCER .5 cr.
482. MEN'S LACROSSE .5 cr.
483. BASEBALL .5 cr.
484. SOFTBALL .5 cr.
485. MEN'S BASKETBALL .5 cr.
486. WOMEN'S LACROSSE .5 cr.
487. FIELD HOCKEY .5 cr.
489. WOMEN'S SOCCER .5 cr.
491. WOMEN'S BASKETBALL .5 cr.

*On Campus
†Gunstock

Theory Courses—Physical Education

(500)500. PRINCIPLES OF PHYSICAL EDUCATION
Evolutionary and historical factors affecting the development of P.E. from pre-history to the present. P.E. in the academic community and its relation to the aims and objectives of general education, the world of sports, athletics. 4 cr.

501. ADVANCED FIRST AID AND EMERGENCY CARE
American National Red Cross program in advanced first aid and emergency care. 2 cr.

502. BASIC ATHLETIC TRAINING
Etiology, pathology, acute care, and prognosis of sports injuries. Prerequisite: P.E. 501. 3 cr.

520. WATER SAFETY INSTRUCTORS' COURSE
Analysis of aquatic techniques; methods of teaching swimming, diving, and lifesaving. A.R.C. instructor authorization awarded to candidates with high caliber of personal skill, knowledge, and teaching ability. Prerequisite: current advanced lifesaving certification. 2 cr.

521. THEORY OF COACHING BASKETBALL
Individual and team offense and defense; rules of the game. Problems in team handling and conditioning. Prerequisite: P.E. 485 or 491. 2 cr.

522. THEORY OF COACHING FOOTBALL
Systems of play; team and individual offensive and defensive fundamentals; theory and strategy of team play; coaching methods, physical conditioning; rules. 2 cr.

(523). THEORY OF COACHING HOCKEY
Basic hockey skills. Fundamentals of individual and team offense and defense; coaching methods; rules. 2 cr.

524. THEORY OF COACHING BASEBALL
Batting and fielding; fundamentals of each position; problems of team play; coaching methods; physical conditioning; rules. Prerequisite: P.E. 483 or 484. 2 cr.

(525). THEORY OF COACHING SOCCER
Fundamental and advanced skills and techniques; offensive and defensive principles of team play; tactical formations and strategy; methods of training and practicing; rules. Prerequisite: permission of instructor. 2 cr.

(526). THEORY OF COACHING WRESTLING
Theory, practical teaching methods, and the development of advanced skills and techniques from basic maneuvers to the more advanced to develop ability to teach and coach wrestling. Prerequisite: P.E. 480. 2 cr.

(527). AQUATIC LEADERSHIP TRAINING
Methods, organization, and administration of A.R.C. and YMCA aquatic programs. Methods of teaching swimming, diving, and lifesaving; program planning; officiating; operation and maintenance of swimming pools; camp waterfront; health and safety aspects of aquatic programs; legal problems; skin and SCUBA diving; drownproofing. Prerequisite: current advanced lifesaving certificate. 2 cr.

(528). THEORY OF COACHING TRACK AND FIELD
Starting, sprinting, middle-distance and distance running, relay, hurdling, high and broad jumping, pole vault, shot putting, discus, hammer, and javelin. Methods of training and practicing. Prerequisite: P.E. 473. 2 cr.

529. THEORY OF COACHING GYMNASTICS
Theory, practical teaching methods, and officiating. Construction of gymnastic routines, from elementary to international level. Prerequisite: P.E. 470. 2 cr.

530. THEORY OF COACHING SWIMMING AND DIVING
Philosophy, historical development, and psychological theories of coaching. Mechanical and kinesiological aspects of the competitive strokes and required and optional dives, low and high board. Prerequisite: P.E. 447. 2 cr.

531. THEORY OF COACHING FIELD HOCKEY
Analysis of field hockey coaching techniques. New systems of play; use of interval training for pre-season conditioning and in-season practices. Prerequisite: P.E. 487 or permission of instructor. 2 cr.

532. THEORY OF COACHING TENNIS
Tennis fundamentals, technical play, and application of offensive and defensive strategies in the singles and doubles game. Coaching tactics and principles for special competitive situations. Prerequisite: P.E. 477 or permission of instructor. 2 cr.

540. MOTOR EFFICIENCY AND IMPAIRMENT IN CHILDREN AND ADOLESCENTS
Motor development and motor behavior in normal populations of children at all age levels; perceptual-motor dysfunction, analysis of perceptual-motor training programs, and determination of the role of movement in cognitive development. 4 cr.

563. THE THEORY OF TEACHING PHYSICAL EDUCATION IN THE SECONDARY SCHOOL
Teaching methods. Prerequisite: minimum of 6 credits from coursework numbered P.E. 470-491. 4 cr.

606. NEUROLOGY
Morphology, physiology, and histology of the human nervous system. Designed primarily for students in occupational therapy. Prerequisite: Zoo. 507-508. 4 cr.

610. ADAPTED PHYSICAL EDUCATION
Common disorders of handicapped children; practical experience in the remediation of those disorders through the use of Adapted Physical Education Activities. Prerequisite: Zoo. 507-508. 4 cr.

620. PHYSIOLOGY OF EXERCISE
Acute and chronic effects of exercise. Respiration, circulation, and energy metabolism. Laboratory sessions demonstrate physiological adaptation to muscular activity. Prerequisite: Zoo. 507-508. 4 cr.

621. EXERCISE LABORATORY TECHNIQUES
Administration of graded exercise tests on treadmill, bicycle ergometer and stepping bench. Monitoring physiological variables during the graded exercise test. Calculation of metabolic data resulting from the exercise test. Prerequisite: P.E. 620. 2 cr.

622. THERAPEUTIC EXERCISE AND EXERCISE PRESCRIPTION
Use of exercise test results to design, prescribe, and conduct exercise programs, primarily for adults. Prerequisite: P.E. 620. 3 cr.

625. DYNAMICS OF HUMAN MOVEMENT
Kinesiological consideration of factors which affect efficiency. Cinematographic and non-cinematographic forms of analysis of selected movement events and sequences. Prerequisite: Zoo. 507. (Not open to students who have taken P.E. 652.) 4 cr.

630. EVOLUTION OF SPORT
Sports as an institution in selected geographical areas of the world. Relationship to war, art, and religion; ritualistic role; historic use by nations. Primarily for non-major students. Prerequisite: permission of instructor. 4 cr.

633. SOCIAL FOUNDATIONS OF SPORT AND PHYSICAL ACTIVITY
Interdependence of human movement experiences, as exemplified in sport, play, and games, and various cultural, subcultural, and social factors. Prerequisite: Sociology 400. 4 cr.

635. CONTEMPORARY LITERATURE IN THE SOCIO-CULTURAL ASPECTS OF SPORT AND PLAY
Current theory in sport, play, and related areas. Opportunity to pursue in-depth study. 4 cr.

637. SPORT—AN ETHOLOGICAL APPROACH
Survey of ethology (animal behavior). Ethological principles applied to the development and conduct of sports and to other disciplines such as psychology, sociology. Prerequisite: Sociology 411 or permission of instructor. 4 cr.

650. EXERCISE SPECIALIST INTERNSHIP
A six-month internship in an agency which offers physical activity programs of intervention and rehabilitation. Experiences include progressive exercise testing, exercise prescription, and exercise session leadership. Prerequisite: P.E. 622. 8 cr.

(652). KINESIOLOGY
The science of human motion. Human muscular anatomy; actions of skeletal muscles using electromyographic evidence. Concepts of muscle physiology and biomechanics to physical education activities. Prerequisite: Zoo. 507. (Not open to students who have taken P.E. 625.) 4 cr.

(668)668. MEASUREMENT PROCEDURES IN PHYSICAL EDUCATION
Essential elementary statistical methods; measurement data scientifically evaluated for application to the program. 4 cr.

692. THEORIES OF TEACHING PHYSICAL EDUCATION IN THE ELEMENTARY SCHOOL
Current theories and methods; consideration given to growth and developmental needs in curriculum planning. Prerequisite: 6 credits from P.E. 470-491 including 472. 4 cr.

(696)696. INDEPENDENT STUDY
In-depth study with faculty supervision. Prerequisite: junior standing, approval of the major adviser, and the faculty of the area concerned. 2-4 cr.

702. ADVANCED ATHLETIC TRAINING
Assessment, rehabilitative treatment, preventive strapping and protective equipment used in athletic training. Administration of a training room facility. Prerequisite: P.E. 502. 4 cr.

703. LABORATORY PRACTICE IN ATHLETIC TRAINING
150 hours of experience in UNH athletic training room under N.A.T.A. certified trainer. Prerequisite: P.E. 502. May be repeated up to 8 cr. 2 cr.

720. INTERPRETATION AND ASSESSMENT OF PHYSICAL FITNESS
Planning and implementation of programs of conditioning and fitness in the general program of education in the school. Personal fitness; components of physical fitness and conditioning; current tests; rehabilitation of individuals of all ages, particularly in college and adult programs. Prerequisite: P.E. 620 or equivalent. 4 cr.

730. CURRICULUM PLANNING IN PHYSICAL EDUCATION
Criteria and factors involved in planning and construction of school programs. 4 cr.

(740). PERCEPTUAL MOTOR DYSFUNCTION
Theoretical rationale and clinical perceptual-motor training programs of Ayres, Kephart, Cratty, Barsch, and Getman, as they relate to sensory-motor integration and the remediation of learning disabilities. Prerequisite: P.E. 775, 540, or permission of the instructor. 4 cr.

760. EVOLUTION AND CULTURAL FOUNDATIONS OF PHYSICAL EDUCATION
Forces shaping the conduct and content of programs in selected societies today. Exploration of sport, dance, and physical education in the light of new knowledge in ethology and behavioral sciences. 4 cr.

775(775). PERCEPTUAL MOTOR LEARNING
Variables affecting the learning and performance of skilled activity; ability and motivational characterstics of the learner; processes for skill acquisition. Prerequisite: Psych. 401. 4 cr.

780. PSYCHOLOGICAL FACTORS IN SPORT
Factors of outstanding athletic achievement; psychological variables in competition; the actions and interactions of sport, spectator, and athlete. Prerequisite: Psycho. 401 or P.E. 775. 4 cr.

791. HISTORY OF PHYSICAL EDUCATION
From ancient Egypt to modern times. Influences of Greece, Rome, the Renaissance and Reformation periods, and modern European Nationalism. Analysis of events and the beliefs of leaders in the development of systems of physical education. 4 cr.

Physics (PHYS)

Chairperson: Robert E. Houston, Jr.

PROFESSORS: Harry H. Hall, emeritus; Roger L. Arnoldy, L. Christian Balling, Edward L. Chupp, Robert E. Houston, Jr., Richard L. Kaufmann, Robert H. Lambert, John A. Lockwood, Lyman Mower, John E. Mulhern, Jr., William R. Webber
ASSOCIATE PROFESSORS: John F. Dawson, Harvey K. Shepard, Robert E. Simpson
ASSISTANT PROFESSORS: Barry J. Harrington, John J. Wright

401-402. INTRODUCTION TO PHYSICS I AND II
Broad survey of classical and modern physics with emphasis on the latter. Designed to enable the student to appreciate the role of physics in the society and technology of today. While emphasis is placed upon the fundamental laws of nature on which all science is based, the interrelationship with other disciplines will be stressed. 2 lec/1 rec/1 lab/4 cr.

403-404. INTRODUCTORY PHYSICS FOR BIOLOGISTS
Physical principles of mechanics, thermodynamics, acoustics, optics, electricity, and modern physics, illustrated where possible, using examples of interest to biologists. A knowledge of high school algebra and trigonometric functions is essential. 3 lec/1 lab/4 cr.

405(405). CONCEPTS OF PHYSICS
Descriptive course investigating a limited number of important physical systems. Emphasis on how the system is to be investigated and the patterns in which the results fall. Intuitive concepts used in investigations will be traced into their application in modern physics. Patterns of thought in physics will be related to patterns of thought in liberal arts. Recommended for liberal arts juniors and seniors. 4 cr.

406(406). INTRODUCTION TO MODERN ASTRONOMY
Descriptive coverage of contemporay astronomical and astrophysical techniques with a review of current knowledge and theories concerning the solar system, galaxies, and the universe. Recommended for liberal arts and beginning science students. 4 cr.

407-408. GENERAL PHYSICS I AND II
Elementary course emphasizing mechanics as the foundation underlying all physics; selected topics from electrostatics and electromagnetism. Prerequisite: knowledge of algebra and trigonometry, Math 425-426 or taken concurrently. Physics 407: 3 lec/2 rec/1 lab. Physics 408: 2 lec / 2 rec / 1 lab / 4 cr.

411. HOUSEHOLD PHYSICS
Practical non-mathematical introduction to the physical principles necessary to understand how and why common devices work. Emphasis on household appliances and automobile. Classroom demonstrations and laboratories to illustrate theories and practical applications. Prerequisite: permission of instructor. (Students may receive credit for either 411 or 412, but not both.) 3 lec/1 lab/4 cr.

412. TECHNICAL PHYSICS
Applied course similar to Physics 411 but with more emphasis on industrial machinery and instruments. Recommended for Thompson School students. Prerequisite: algebra, trigonometry, permission of instructor. (Students may receive credit for either 411 or 412, but not both.) 3 lec/1 lab/4 cr.

505. GENERAL PHYSICS III
Wave motion, kinetic theory, and classical physics. Introduction to the study of systems of many particles. Prerequisite: Physics 408 and Math 527 passed or taken concurrently. 3 lec / rec / 1 lab / 4 cr.

506. GENERAL PHYSICS IV
Introduction to quantum physics, including special relativity, the structure of atoms and nuclei, and the basic ideas of quantum mechanics. Prerequisite: Physics 408 and Math 527. 3 lec / 1 rec / 1 lab / 4 cr.

510. INTRODUCTION TO MODERN COSMOLOGY
Review of the Sun, stars, Milky Way, external galaxies, and expansion of the universe. Recent discoveries of radio galaxies, quasi-stellar objects, cosmic black-body radiation, x-rays, and gamma rays precede a discussion of Newtonian and general relativistic cosmological models, steady-state/big-bang theories, and matter-antimatter models. Prerequisite: elementary astronomy, basic physics, or permission of instructor. Not for students without some mathematical background. 4 cr.

602. THERMAL PHYSICS
Classical and statistical approach to thermodynamics. Kinetic theory. Prerequisite: Physics 408, 505; or equivalent; Math 528. 4 cr.

605-606. EXPERIMENTAL PHYSICS I AND II
Electrical measurements and circuits, passive and active circuit elements, microwaves, optics, and atomic physics. Prerequisites: Physics 408, 506, Math 527 passed or taken concurrently. 2 lec/2 lab/4 cr.

607. PHYSICAL OPTICS
Electromagnetic theory of light, interference, diffraction, polarization, related phenomena, and non-linear optics. Prerequisite: Math 528. 4 cr.

609-610. EXPERIMENTAL PHYSICS III AND IV
Modern physics experiments and special project problems are assigned to individual students. Prerequisite: senior standing in physics.2 lab/4 cr.

613,614. SPECIAL TOPICS I AND II
Any selected topics not covered sufficiently well in a general course may be studied. Prerequisite: senior standing in physics. Variable 1-8 cr.

616. PHYSICAL MECHANICS I
Analytical treatment of classical mechanics covering dynamics of particles and rigid bodies. Newton's laws, conservation theorems, oscillations, central force problem, generalized coordinates, and Lagrange's equations. Prerequisite: Physics 505 or equivalent; Math 528 passed or taken concurrently. 4 cr.

617. PHYSICAL MECHANICS II
Selected classical mechanics topics; wave motion, coupled oscillation, and vector field theory. Prerequisite: Physics 616 or equivalent. 4 cr.

618. INTRODUCTION TO SOLID STATE PHYSICS
Theory underlying the behavior of solids. Transport theory and the interaction of radiation and matter. Operation of semiconducting and superconducting devices and lasers. Prerequisite: Math 527, Physics 506, or equivalent. 4 cr.

695-696. DIRECTED STUDY
Individual projects under direction of a faculty adviser. Permission of the department required. Variable 1-8 cr.

701. INTRODUCTION TO QUANTUM MECHANICS
Applications to atomic and molecular spectra. Prerequisite: Math 527, 528 and consent of instructor. 4 cr.

702. ATOMIC AND NUCLEAR PHYSICS
Natural radioactivity; nuclear reactions and scattering; models of the nucleus; high energy, nuclear physics; cosmic rays. Prerequisite: Physics 701. 4 cr.

703-704. ELECTRICITY AND MAGNETISM I AND II
Foundation of electromagnetic theory; electrostatics, dielectric theory, electromagnetism, magnetic properties of matter, alternating currents, Maxwell's field theory, and an introduction of electrodynamics. Prerequisite: Math 527, 528 and consent of instructor. 4 cr.

Plant Science (PLSC)

Chairperson: Lincoln C. Peirce

PROFESSORS: Ford S. Prince, emeritus; R. Eggert, emeritus; Clarence A. Langer, emeritus; Gerald M. Dunn, Lincoln C. Peirce, Owen M. Rogers, Douglas G. Routley
ASSOCIATE PROFESSORS: George O. Estes, Yun Tzu Kiang, James B. Loy, James R. Mitchell, Jerry A. Warren, Otho S. Wells
ASSISTANT PROFESSORS: David A. Hopfer, David Koch, James E. Pollard
ADJUNCT ASSISTANT PROFESSOR: Merrill B. Hoyle

421. CONCEPTS OF PLANT GROWTH
Fundamentals underlying plant growth and response in natural and modified environments. Mr. Estes. 3 lec/1 lab/4 cr.

427. LANDSCAPING THE HOME GROUNDS
Design and maintenance of small properties; arrangement, plant use for the beautification of home surroundings. Mr. Rogers. 2 lec / 1 lab / 4 cr.

522. ENVIRONMENT AND PLANT RESPONSE
How plants respond to light, temperature, water, and atmospheric factors; plants in the conservation and efficient use of environmental resources; effects of pollution; measurement of plant response in natural and controlled environments. Prerequisite: Pl.S. 421. Mr. Koch. 3 lec / 1 lab / 4 cr.

525-526. PLANT CULTURE IN CONTROLLED ENVIRONMENTS
Practicum; using greenhouses and growth chambers. Field trips, discussions, work experience with flowers, vegetables, and conservatory plants. Plant Science majors only. Prerequisite: Pl. S. 421 or equivalent, permission of instructor. Mr. Routley. 1 lab/2 cr.

535. HISTORY AND USE OF CULTIVATED PLANTS
Importance of cultivated plants in various civilizations. Use of plant or plant-derived products in early and contemporary societies. Mr. Loy. 2 lec / 1 lab / 4 cr.

565. RECREATIONAL TURF
Adaptation and management of fine turf grasses for recreational and aesthetic use.3 lec/3 cr.

604. PRINCIPLES OF GENETICS
Chemical and physical bases of inheritance; genes and chromosomes as units of mutation; genes in populations. *Students desiring formal laboratory experience should register in Genetics 706.* Prerequisite: Basic laboratory course in biological sciences. Organic chemistry and college math or statistics suggested. Mr. Kiang. Offered as Zoo. (604) alternate semester.3 lec/1 rec/4 cr.

(606)606. PLANT PHYSIOLOGY
Function of higher plants; water relations, metabolism, and growth and development. Prerequisite: Bot. 411, 503, or Pl.S. 421 and one year of chemistry or permission of instructor. Mr. Minocha (Botany), Mr. Pollard (Pl.S.).3 lec/1 lab/4 cr.

607. WEED SCIENCE
Biology and identification of common weeds; weeds in relation to man; harmful effects of weeds; cultural, biological, and chemical control of weeds; properties and functions of herbicides; herbicides and the environment. Prerequisite: Pl.S. 421. Mr. Kiang. 3 lec / 1 lab / 4 cr. (Alternate year; offered fall 1977.)

672. PLANT PROPAGATION AND MAINTENANCE
Sexual and asexual propagation of horticultural plants. Pl.S. majors only. Mr. Routley. 2 lec/1 lab/4 cr. (Alternate years; offered spring 1978.)

678. ORNAMENTAL PLANTS
Their identification, culture, and use. Prerequisite: Bot. 566 or equivalent. Mr. Rogers. 3 lec / 1 lab / 4 cr.

695(695). TOPICS IN CROP PRODUCTION
Lectures, discussions, readings, and labs in growth and management of crop plants. Prerequisite: Pl.S. 421 or equivalent. A) Fruit Crops, Mr. Pollard. 3 lec/1 lab/4 cr. B) Vegetable Crops, Mr. Peirce, 3 lec/3 cr. C) Forage Crops, Mr. Koch. 3 lec / 1 lab / 4 cr. D) Grain Crops, Mr. Koch. 3 lec / 3 cr.

705. POPULATION GENETICS
Population growth and regulation; distribution of genes; factors affecting gene frequency; genetic load; cost of natural selection; ecological genetics. Prerequisite: Zoo. or Pl.S. 604 and For. Res. 528, or equivalents, or permission of instructor. Mr. Kiang. 4 lec / 4 cr. (Alternate years, offered fall 1976.)

708. PLANT NUTRITION
Nutritional aspects of higher plants; uptake, translocation, and metabolic role. Prerequisites; plant physiology, soils. Mr. Estes. 3 lec / 1 lab/4 cr. (Alternate years; offered spring 1978.)

732. PLANT DEVELOPMENTAL GENETICS
Gene action in relation to development in plants; isozymes and differentiation, chromosomal proteins and gene regulation, temporal specificity of gene action, nuclear-cytoplasmic interactions, chemical gradients and gene activation. Prerequisite: Pl.S. or Zoo. 604, Pl.S. 606, or equivalents. Mr. Loy. 3 lec/1 lab/4 cr.(Alternate years; offered spring 1977.)

740. EVOLUTIONARY BIOLOGY
The synthetic theory of evolution in the origin of life, species, and higher groups; sources of genetic variability; population structure; causes of evolution; evolution of communities; molecular evolution and rates of evolution. Prerequisite: Zoology or Pl.S. 604, or equivalent, or permission of instructor. Mr. Kiang. 4 lec/4 cr.(Alternate years; offered spring 1978.)

(762.) PLANT METABOLISM
Function, occurrence, synthesis, and degradation of plant consituents; respiration and photosynthesis; metabolism of nitrogenous and aromatic compounds; biochemical mechanisms in seed dormancy, fruit ripening, and disease resistance. Prerequisite: Biochem. 601 or 751. Mr. Routley. 2 or 4 cr. (Alternate years; offered fall, 1976.)

773. METHODS AND THEORY OF PLANT BREEDING
Plant breeding systems for qualitative and quantitative plant improvement. Prerequisite: Pl.S. or Zoo. 604, For. Res. 528, or permission of instructor. Mr Peirce. 3 lec/3 cr. (Alternate years; offered fall 1976.)

776. RADIOISOTOPE TECHNIQUES FOR LIFE SCIENCES
Application of radioisotopes to biological systems; detection and measurement, liquid scintillation spectrometry and autoradiography, gamma-ray spectrometry, radiochromatogram scanning, and tissue distribution of radioisotopes. Prerequisite: inorganic chemistry and physics. Mr. Estes. 2 lec / 2 lab / 4 cr.

795,796. ADVANCED TOPICS IN PLANT SCIENCE
Independent research, study, or group discussion. A) Physiology, Mssrs. Estes, Koch, Pollard, Routley; B) Genetics, Mssrs. Estes, Koch, Pollard, Routley; C) Plant Utilization, Staff. Prerequisite:permission of instructor. 2 or 4 cr.

Political Science (POLT)

Chairperson: Lawrence W. O'Connell

PROFESSORS: John T. Holden, emeritus; Robert B. Dishman, Bernard K. Gordon, George K. Romoser, Allan Spitz
ASSOCIATE PROFESSORS: John R. Kayser, David L. Larson, Lawrence W. O'Connell, Susan O. White, Frederic W. Wurzburg
ASSISTANT PROFESSORS: Robert E. Craig, Joseph P. Ford, David W. Moore, B. Thomas Trout
INSTRUCTORS: Warren R. Brown, George K. Lagassa

Except for the introductory courses (401-402) Political Science offerings are listed by fields at the 500, 600, and 700 level. For detailed information and guidance on these designations see the Political Science description in the catalog section, "Majors in the Bachelor of Arts Program." Generally, courses numbered 600 and above are not open to freshmen; and courses numbered 700 are not open to freshmen and sophomores. Seminars (790-799) are open only to seniors. Announcements of seminar topics are available each semester from the Political Science office. Courses relevant to more than one field are cross-listed.

Introductory Courses and Independent Study

(400)400. CONTEMPORARY POLITICAL ISSUES
Introduction to politics focusing on specific national and international issues of current interest. Not for major credit. 4 cr.

(401)401. INTRODUCTION TO POLITICAL SCIENCE
Nature of politics and political science, including its vocabulary and purpose. Political institutions, thought, ideologies, and behavior, as well as behavior among levels of governments. Required of all majors.4 cr.

(402)402. AMERICAN NATIONAL GOVERNMENT
Institutions and processes of national government in the United States. Required of all majors, but may be waived after successful completion of departmental examination permitting the substitution of Pol.Sci. 531. 4 cr.

795,796. INDEPENDENT STUDY
For juniors and seniors with at least 3.0 cumulative GPA. Specialized programs of study. Application guidelines in department office. Prerequisite: permission of instructor. 4 cr.

Political Thought

(501)501. POLITICAL THOUGHT AND POLITICAL ACTION: INTRODUCTION TO POLITICAL PHILOSOPHY
Theoretical assumptions of political life, as reflected in the thought of Plato or Aristotle; Machiavelli; Hobbes or Locke; Rousseau or Nietzche; Hegel or Marx. Illustrations of political movements, including the ideological attempt to combine theory and practice. Prerequisite for majors: Pol. Sci. 401 and 402 (or 531). Not open to freshmen except by instructor's permission. Required of majors intending further study in this field. 4 cr.

Intermediate and Advanced Courses in Political Thought. Prerequisite for majors: Political Science 501; for non-majors: a previous course in Political Science or, with the consent of the instructor, successful completion of a course in a related field.

600. CLASSICAL AND MEDIEVAL POLITICAL THOUGHT
Development of western political thought. Intensive study of Greek, Roman, and medieval thinkers, including Socrates, Plato, Aristotle, Cicero, St. Augustine, St. Thomas. 4 cr.

601. POST-RENAISSANCE POLITICAL THOUGHT
Development of modern conceptions of politics, and the philosophical premises upon which those theories are based, as reflected in the work of major theorists from Machiavelli through Rousseau. 4 cr. (Alternate years.)

602. CONTEMPORARY POLITICAL THOUGHT AND IDEOLOGIES
Major thinkers from Hegel and Marx to the present, with emphasis on the genesis of contemporary ideologies. 4 cr. (Alternate years.)

603. THE DEVELOPMENT OF AMERICAN POLITICAL THOUGHT
Aspects of American political ideas from the Puritans to the present.4 cr.

621. LOGIC OF EMPIRICAL INQUIRY
(See listing under Scope and Methods.)4 cr.

700. POLITICAL THOUGHT AND CULTURE
Relation between man's artistic and social endeavors and forms, and his political thought. Study of politics and literature through figures such as Aristophanes, Swift, Shakespeare, and contemporary writers.4 cr.

701. THE SCIENTIFIC STUDY OF POLITICS: ITS PHILOSOPHICAL DEVELOPMENT
Formulations and criticisms of the scientific study of politics beginning with Aristotle, and reviewing the development of modern scientific method from Bacon to the present.4 cr. (Alternate years.)

702. IDEOLOGIES AND DISSENT IN AMERICA AND THE WEST
Ideas and movements of protest since the late 19th century, particularly attacks upon liberal democratic theory and practice. 4 cr.(Alternate years.)

797,798. SECTION I:SEMINAR IN POLITICAL THOUGHT
Advanced treatment and individual research. Prerequisite: senior or graduate standing. 4 cr.

Scope and Methods

621. LOGIC OF EMPIRICAL INQUIRY
Empirical mode of procedure for analysis and explanation of political reality. Prerequisite for majors: Pol. Sci. 401 and 402 (or 531); for non-majors, permission of instructor. 4 cr. (Alternate years.)

720. METHODS OF RESEARCH IN POLITICAL BEHAVIOR
Techniques in evaluting political behavior; surveys, experimental designs, and basic data processing. Aspects of computer technology and political research. 4 cr.(Alternate years.)

701. SCIENTIFIC STUDY OF POLITICS: ITS PHILOSOPHICAL DEVELOPMENT
(See listing under Political Thought.) 4 cr.

732. THE PSYCHOLOGY OF POLITICAL BEHAVIOR
(See listing under American Politics.) 4 cr.

793. CONTEMPORARY POLITICAL ANALYSIS
Forms of contemporary political analysis; methods of empirical inquiry and explanation; modes of justification. Prerequisite: senior or graduate standing, or permission of instructor. 4 cr.

American Politics

(531)531. AMERICAN PUBLIC POLICY
Processes by which American policy makers deal with such issues as ecology, crime, unemployment, civil rights. Prerequisite for majors: Pol. Sci. 401, 402 or successful completion of a departmental examination. Required of majors intending further study in American politics. 4 cr.

Intermediate and Advanced Courses in American Politics. Prerequisite for majors: Political Science 531; for non-majors: a previous course in Political Science or, with consent of the instructor, successful completion of a related course in another field.

630. STATE GOVERNMENT AND POLITICS
Comparative analysis of the environment and workings of American state politics. Attention to state legislatures, bureaucracies, interest-group influence, and problems of taxation. 4 cr.

631. LOCAL GOVERNMENT AND POLITICS
Theory, structure, and politics of American local government, including municipalities, counties, and special districts. Attention to community decision-making, political participation, and selected policy areas such as land-use control and taxation. 4 cr.

632. AMERICAN PRESIDENCY
Role and powers of the presidency in domestic, and foreign affairs. The president as administrator, policy-maker, and political leader. Executive-congressional relations. 4 cr.

633. AMERICAN CONGRESS
Structure, powers, and decisional processes. Committee structure, representational roles, legislative oversight, and party cleavage.4 cr.

634. POLITICAL PARTIES AND VOTING BEHAVIOR
Functions, organization, operation, and bases of electoral support of American political parties. 4 cr.

635. THE POLITICS OF CRIME AND JUSTICE
Criminal justice theory and practice; contemporary role of police, prosecutors, judges, juries, counsel, and interest groups in the legal process. 4 cr.

636. SUPREME COURT AND THE JUDICIAL PROCESS
Supreme Court as interpreter of law and arbiter among forces in American politics. 4 cr.

730. ADMINISTRATIVE PROCESS
Principal concepts of administrative behavior and public bureaucracy. 4 cr.

731. URBAN AND METROPOLITAN POLITICS
Planning and management of the urban community. Intergovernmental relations, administrative functions, and general urban problems. 4 cr.

732. PSYCHOLOGY OF POLITICAL BEHAVIOR
Cultural, social, economic, and emotional forces influencing the citizen's political activity. 4 cr.

733. INTERGOVERNMENTAL RELATIONS AND FEDERALISM
Interrelationship of national, state, and local governments in the American federal system. Patterns of regionalism, interstate cooperation and conflict, and the evolution of federal relations. 4 cr.

734. ELECTION PRACTICUM
Analysis of the electoral process with field work in political campaigns. Not offered every year. Prerequisite: permission of instructor. 4 cr.

735. AMERICAN PLURALISM
Focus on a particular problem in American politics, such as the role of private power, interest groups, participation and representation, civil liberties, and political freedom. 4 cr. (Alternate years.)

758. COMPARATIVE JUDICIAL PROCESS
(See listing under Comparative Politics.) 4 cr.

759. COMPARATIVE LEGISLATIVE BEHAVIOR
(See listing under Comparative Politics.) 4 cr.

797,798. SECTION 2: SEMINAR IN AMERICAN POLITICS
Advanced analysis and individual research. Prerequisite: senior or graduate standing. 4 cr.

797,798 SECTION 6: SEMINAR IN PUBLIC ADMINISTRATION
Advanced analysis and individual research, including opportunities for direct observation of governmental administration. Prerequisite: senior or graduate standing. 4 cr.

Comparative Politics

(551)551. COMPARATIVE POLITICS
Concepts, approaches, and problems of comparing political systems using case studies of contemporary foreign governments. Prerequisite for majors: Pol. Sci. 401 and 402 (or 531); for freshmen: permission of instructor. Required of majors intending further study in comparative politics. 4 cr.

Intermediate and Advanced Courses in Comparative Politics: Prerequisite for majors: Political Science 551; for non-majors: successful completion of a course in Political Science or, with consent of instructor, successful completion of another course in a related field or discipline.

650. DEMOCRATIC SYSTEMS
Major governments, including but not restricted to those in Western Europe, characterized by parliamentary and other forms of competitive politics. 4 cr.(Alternate years.)

651. DEVELOPED AND MODERN STATES
Comparative political analysis of major "advanced" states characterized by industrialization and complex organization, with emphasis on but not restricted to such states as US, USSR, Japan, Germany, France. 4 cr.(Alternate years.)

652. DICTATORSHIP AND TOTALITARIANISM
The political systems of Nazi Germany, Stalinist Russia, Maoist China, and Fascist Italy. 4 cr.

653. DEVELOPING NATIONS
Comparative analysis of politics in selected modernizing states in Africa, Latin America, Asia, Middle East. 4 cr. (Alternate years.)

A. Area Studies

750. POLITICS IN WEST EUROPE
Aspects of the politics of the major continental powers. 4 cr. (Alternate years.)

751. MAJOR COMMONWEALTH STATES: BRITAIN, CANADA, AUSTRALIA
Comparison and analysis of major governments influenced by the British parliamentary system; federal systems and ethnic diversity as exemplified by French Canada. 4 cr. (Alternate years.)

752. POLITICS IN THE USSR AND EAST EUROPE
Comparative analysis of the background, structure, and underlying issues of political systems. Ideological bases, political history, and contemporary trends. 4 cr.

753. MAJOR GOVERNMENTS OF EAST ASIA:CHINA AND JAPAN
Political development within the historical context; related economic, social, and cultural variables. Comparative perspective where appropriate. 4 cr.

755. GOVERNMENT AND POLITICS IN SOUTHEAST ASIA
4. cr.(Alternate years.)

797,798. SECTION 3: SEMINAR IN COMPARATIVE POLITICS OF NATIONS
Includes advanced analysis and individual research on national or regional politics. Prerequisite: senior or graduate standing. 4 cr.

B. Problems in Comparative Politics and Development

757. POLITICAL DEVELOPMENT AND POLITICAL DECAY
Issues and concepts of political change. 4 cr.(Alternate years.)

758. COMPARATIVE JUDICIAL PROCESSES
Court systems and their relationships to political life; political, social, and structural influences on judicial behavior; law and human behavior. 4 cr.(Alternate years.)

759. COMPARATIVE LEGISLATIVE BEHAVIOR
Role, organization, operation, and conduct of legislatures in national political systems. 4 cr.(Alternate years.)

760. COMPARATIVE COMMUNIST SYSTEMS
Interest groupings, elites, and decision-making; political behavior within communist international organizations; intraparty distinctions between ruling and non-ruling communist parties. 4 cr.(Alternate years.)

761. POLITICAL SOCIOLOGY
Impact of social structure and change upon political behavior, including elite/mass relationships, integration and instability. Major empirical findings and theoretical contributions, from Marx and Weber to the present. 4 cr.(Alternate years.)

797,798. SECTION 4: SEMINAR IN COMPARATIVE POLITICS
Includes advanced analysis and individual research. Administration, foreign policy, political parties, and governmental institutions. Prerequisite: senior or graduate standing. 4 cr. (Alternate years.)

Related Courses

779. FOREIGN POLICIES IN EUROPE
(See International Politics.) 4 cr.

780. FOREIGN POLICIES OF THE USSR AND SOVIET BLOC
(See International Politics.) 4 cr.

781. INTERNATIONAL POLITICS OF EAST ASIA
(See International Politics.) 4 cr.

International Politics

571. INTRODUCTION TO INTERNATIONAL POLITICS
Concepts associated with causes of international conflict and efforts to prevent it. The development of a system of nations, behavior of nations and related contemporary issues. Prerequisite for majors: Pol. Sci. 401 and 402 (or 531); for freshmen: permission of instructor. Required of majors intending further study in international politics. 4 cr.

Intermediate and Advanced Courses in International Politics.
Prerequisite for majors: Political Science 571; for non-majors: a previous course in Political Science or, with consent of the instructor, successful completion of a course in a related field.

672. FOREIGN POLICIES OF MAJOR POWERS
Interaction of national policies; comparison of major powers' national interest and objectives. Among other techniques internation simulation may be used. Simulation fee may be assessed. 4 cr.

673. THE FOREIGN POLICY PROCESS OF THE UNITED STATES
Institutions and interests that shape and administer foreign policy and their historical development; the President and National Security Council, Congress, and the major agencies at home and abroad.(Also fulfills AFROTC requirement.) 4 cr.

674. CONTEMPORARY ISSUES IN AMERICAN FOREIGN POLICY AND WORLD POLITICS
American role and problems of choice in contemporary world politics.4 cr.

775. THEORIES OF INTERNATIONAL POLITICS AND INTEGRATION
General explanations for the behavior of nations and of the theory and practice of supra-national integration. Theories of peace and security and community building at the international level. Concepts and practices of arms limitation and conflict resolution. 4 cr.(Alternate years.)

776. STRATEGY AND NATIONAL SECURITY POLICY
Defense and deterrence among the major powers; impact of modern weapons on war and arms limitation. Armed forces role in shaping defense policy. (Also fulfills AFROTC requirement.) 4 cr.

777. INTERNATIONAL LAW
Formalized processes for regularizing state behavior; development of norms based on custom, precedent, and formal institutions, as in treaties and cases. Arms reduction and limitation arrangements; inspection; and other formal procedures designed to preserve peace.4 cr.(Alternate years.)

778. INTERNATIONAL ORGANIZATION
Collective security and other forms of cooperation among nations through international organizations such as the United Nations and its predecessors, and through regional bodies. 4 cr. (Alternate years.)

779. FOREIGN POLICIES IN EUROPE
East-West relations, security alliances, economic and political cooperation, and the impact of domestic change and superpower relationships on international politics in Europe. 4 cr. (Alternate years.)

780. FOREIGN POLICIES OF THE USSR AND THE SOVIET BLOC
Foreign policy and strategy in its national and European coalition context;Soviet-American and Sino-Soviet relations. 4 cr.

781. INTERNATIONAL POLITICS OF EAST ASIA
Foreign and defense policies emphasizing Japan, China, and selected Southeast Asian nations, including their efforts at cooperation. 4 cr.

797,798. SECTION 5: SEMINAR IN INTERNATIONAL POLITICS
Advanced analysis and individual research; emphasis on developments in theory. Prerequisite: senior or graduate standing. 4 cr.

Portuguese

(See Spanish and Classics)

Psychology (PSYC)

Chairperson: Ronald E. Shor

PROFESSORS: Herbert A. Carroll, emeritus; George M. Haslerud, emeritus; Robert I. Watson, emeritus; Raymond L. Erickson, Eugene S. Mills, John A. Nevin, Ronald E. Shor

ASSOCIATE PROFESSORS: Lance K. Canon, Rand B. Evans, Peter S. Fernald, G. Alfred Forsyth, Earl C. Hagstrom, Daniel C. Williams

ADJUNCT ASSOCIATE PROFESSORS: Robert G. Congdon

ASSISTANT PROFESSORS: Gregory J. Bertsch, James R. Davis, John E. Limber, E. Allan Lind, David I. Schickedanz, Marty J. Schmidt, Stephen J. Weber, William R. Woodward

The listings below are general descriptions of the courses. The student is referred to the Instructors' Course Descriptions published by the department each semester for specific details about each section. Listings will be made available in departmental offices prior to and during the preregistration period. All courses offered each year unless otherwise noted. All general courses and basic major courses offered every semester.

General Courses

401(401). INTRODUCTION TO PSYCHOLOGY
Psychology as a behavioral science, its theoretical and applied aspects. Prerequisite for all other courses in the department. To actively experience the nature of the psychological research, the student is expected to meet a laboratory experience requirement. 4 cr.

511(511). INTRODUCTION TO PERCEPTION, LANGUAGE, AND THOUGHT
Human mental processes. Visual and auditory preception; language and communication; thinking;problem solving;and creativity. Interrelationships among these areas of human psychology. Prerequisite: Psych. 401. 4 cr.

521(521). PRINCIPLES OF LEARNING AND THEIR APPLICATION
Principles developed from experimental study of human and animal learning; their theoretical integration; their application to the understanding of human behavior. Procedures for changing behavior in practical situations, related to theories of learning. Prerequisite:Psych.401.4 cr.

531(531). PSYCHOBIOLOGY
Man as a biological machine; advantages and limits of such an approach for studying behavior. Perception, language, and thought; learning and memory; emotions from the point of view of physiology. These behaviors in terms of what occurs in the organism. Prerequisite: Psych. 401. 4 cr.

561(561). CLINICAL APPROACHES TO HUMAN BEHAVIOR
Normal and abnormal behavior from the viewpoints of Freud, Rogers, learning theorists, existentialists, and others. Human behavior; clinical procedures of evaluating and modifying behavior. Nature of the clinical approach; no clinical training. Prerequisite: Psych. 401. 4 cr.

581(581). THE STUDY OF CHILD BEHAVIOR
The developing child in the context of his society. Current problems in and influences on development of the child. Personality and cognitive development; and exceptional children. Prerequisite: Psych. 401. 4 cr.

Major Courses

601(601). STATISTICS AND METHODOLOGY IN PSYCHOLOGY
Design, procedure, statistical analysis, and decison making in psychological research. Substantive problems as illustrations of typical applications and underlying logic. Prerequisite: Psych. 401. Required of all undergraduate majors. 4 cr.

(602)602. EXPERIMENTAL PSYCHOLOGY
Experimental methods applied to psychological phenomena; principles of experimental design; methods of data analysis. Each student responsible for an original experiment. Prerequisite: Psych. 601. 5 cr.

621(621). LEARNING AND MOTIVATION
Learning and motivation related to contemporary theories of behavior integrated with other areas of psychology. Theory, research methods, and applications. Major concepts and recent research. Prerequisite: Psych. 401. 4 cr.

651(651). PSYCHOLOGY OF PERSONALITY
Major theories; acquisition, maintenance, and modification of individual behavior. Research and the nature of theorizing. Prerequisite: Psych. 401. 4 cr.

(652)652. SOCIAL PSYCHOLOGY
Behavior of individuals affected by the behavior of other individuals, groups, and society. Attitude change and social influence, conformity, social interraction, research. Prerequisite: Psych. 401. 4 cr.

702. ADVANCED STATISTICS AND RESEARCH METHODOLOGY
Experimental design, analysis, and interpretation. Repeated measures designs, trend analyses, nonparametric analyses, confounding, missing data, interpretation of interactions, and computer processing of data. Intended primarily for majors planning to attend graduate school. Prerequisite: Psych. 601 and one 700-level Psych. course. 4 cr.

704. RESEARCH METHODS IN SOCIAL PSYCHOLOGY
Features, assets, liabilities, and appropriate applications of research techniques, such as systematic observation, attitude measurement, survey methods, field and laboratory experiments, and nonreactive methods. Philosophy of science, ethical responsibility, and artifact in research. Each student responsible for an original research project. Prerequisite: Psych. 601, 652. 4 cr.

705. TESTS AND MEASUREMENT
Testing intelligence, creativity, achievement, interests, and personality. Test construction; evaluation; relation to psychological theory, research, and practice. Prerequisite: Psych 601. 4 cr.

711. SENSATION AND PERCEPTION
Sensory systems in processing information and experiencing objects and events. Global theories of perception and specific perceptual processes. Stimulus definition, scaling, perceptual development, social perception, selective attention, pattern vision, color vision, auditory localization, signal detection, and sensory deprivation. Prerequisite: Psych. 601. 4 cr.

712. PSYCHOLOGY OF LANGUAGE
Theories of language structure; functions of human language; meaning; relationship of language to other mental processes; language acquisition; indices of language development; speech perception; reading. Prerequisite: Psych. 601 or permission of instructor. 4 cr.

713. COGNITION
Complex mental activities; consciousness and attention; concept formation; reasoning; problem solving; creative thinking; relationship between cognition and effective behavior. Prerequisite: Psych. 601. 4 cr.

722. HUMAN LEARNING
Experimental study of human learning and retention. Memory, transfer, verbal learning, perceptual learning, concept learning, and observational learning. Methodologies typical of research in these areas. Prerequisite: Psych. 601 and either 602 or 621. 4 cr.

723. APPLIED BEHAVIORAL ANALYSIS
Applications of learning theory to the solution of socially relevant problems. Appreciation of current research and theory in the field of applied behavior analysis. Prerequisite: Psych. 602 or 621. 4 cr.

731(731). BRAIN AND BEHAVIOR
Relationships between the nervous system and behavior. Physiological neural, and biochemical mechanisms underlying instinct, memory, learning, emotion, and consciousness in man; evolution of these functions in lower animals. Prerequisite: Psych. 601. 4 cr.

732. COMPARATIVE PSYCHOLOGY
Methodologies; comparisons of the basic processes of sensation, motivations, learning, and social behavior in different species. Contemporary theories of behavior formulated by ethologists contrasted and compared with current theories in psychology. Prerequisite: Psych. 601. 4 cr.

754. ATTITUDES AND SOCIAL INFLUENCE
Theories, nature, and measurement of attitude; research and theory on conformity and leadership examined as problems in interpersonal influence. Recent psychological literature. Prerequisite: Psych. 601 and 652. 4 cr.

755. SOCIAL PSYCHOLOGY OF SOCIAL ISSUES
Prejudice, group conflict, overpopulation, war, and ecological problems. Specific social psychological processes applied to the nature and solution of each problem. Prerequisite: Psych. 601, 652. 4 cr.

756. ENVIRONMENTAL PSYCHOLOGY
Human behavior influenced by the physical environment. Environmental factors: The "build" environment; the natural environment; and the social environment. Research and theory in privacy, territoriality, crowding, urban stress, paralinguistics, person perception, and cultural differences. Prerequisite: Psych. 601, 652. 4 cr.

757. POLITICAL PSYCHOLOGY—VOTING BEHAVIOR
Emphasis on the New Hampshire preferential primary. Contrasting analyses of voter decision-making; relationship between public opinion and choice behavior; students collect and analyze data from the primary; development and practice of appropriate research skills. Prerequisite: Psych. 601, 652. 4 cr. (Not offered every year.)

761(761). ABNORMAL PSYCHOLOGY
Disturbing behaviors; historical developments; viewpoints of etiology; identifying and understanding disruptive behavior; diagnostic implications for treatment as a function of varying theoretical viewpoints. Prerequisite: Psych. 601. 4 cr.

762. COUNSELING
Parameters of problems in daily living; analysis of individual, group, and institutional therepeutic interventions. Therapeutic process and outcome; ethical considerations; professional and paraprofessional activities in a variety of work settings. Prerequisite: Psych. 601. 4 cr.

771(771). HISTORY OF PSYCHOLOGY
Reassess, extends, and integrates knowledge of psychology within historical perspective. Antecedents in philosophy and the physical sciences and their relationship to the subsequent development of schools and systems of psychology. Contemporary thought and research. Prerequisite: Psych. 601. 4 cr.

781. DEVELOPMENTAL PSYCHOLOGY
Current research and major theories; cognitive, personality, learning, and emotional development. Prerequisite: Psych. 601; Psych. 581 or Home Ec. 525. 4 cr.

Special Courses

591. SPECIAL TOPICS
New or specialized courses are presented under this listing. Staff present material not normally covered in regular course offerings. Description(s) of courses on file in the Psychology offices during registration. Prerequisite: Psych. 401. 4 cr.

701. CONTEMPORARY TOPICS IN PSYCHOLOGY
Non-credit seminar; topics of particular interest to students. Jointly organized by students and faculty. Prerequisite: Psych. 401. 0 cr.

791. ADVANCED TOPICS
Advanced material in which instructor has specialized knowledge through research and study. May repeat, but not duplicate areas. Course descriptions on file in the Psychology offices during registration. Prerequisite: Psych. 601, 16 credits of psychology or permission of instructor. 4 cr.

793. EXTERNSHIP
Supervised practicum in one of several cooperating N.H. mental health/rehabilitation facilities. Coursework knowledge applied to meaningful work and team experience. Commitment includes a negotiated number of weekly work hours and weekly seminars. Supervision by institutional personnel and the instructor. Student continuation in the course throughout the semester dependent upon favorable periodic performance assessment. Course applications accepted in March for fall term and October for spring term. Prerequisite: permission of instructor, Psych. major, Psych. 601; additional psychology courses desirable. A maximum of 4 credits count toward major. Variable 4-8 cr.

795. INDEPENDENT STUDY
1) Physiological; 2) Perception; 3) History and Theory; 4) Learning; 5) Social; 6) Cognition; 7) Statistics and Methods; 8) Experimental; 9) Personality; 10) Developmental; 11) Counseling; 12) Psychotherapy; 13) Research Apprenticeship; 14) Teaching of Psychology (content area to be determined). Arrangements to be made with a specific faculty member; enrollment by permission only. 1-4 cr.

Recreation and Parks (RECP)

Chairperson of Program: Gus C. Zaso

ASSOCIATE PROFESSOR: Gus C. Zaso
ASSISTANT PROFESSOR: Robert Greenleaf, Lawrence A. Rondeau
ADJUNCT ASSISTANT PROFESSOR: Wilbur F. LaPage
VISITING LECTURERS: Christopher Clews; Margery Milne

400. IMPACT OF LEISURE
Issues which contribute to the emergence of a leisure-oriented society and signigicant problems which accompany the expansion of leisure opportunities. 4 cr.

454. SPECIAL FACILITY OPERATIONS
Management of public, private, and commercial campgrounds. 4 cr.

455. INTRODUCTION TO RECREATION AND PARK SERVICES
Role of recreation and parks in contemporary society. 4 cr.

457. DYNAMICS OF LEADERSHIP AND PROGRAMMING
Leadership processes and their relationship to principles of program planning and evaluation. 4 cr.

543. COMPARATIVE ENVIRONMENTAL EDUCATION
Interdependent environmental analyses with application to recreation and education situations. 4 cr.

544. OUTDOORS EDUCATION
Elements of programming as they relate to the school curriculum and school camping. 4 cr.

560. CAMPUS RECREATION SERVICES
Management of college unions and campus recreation resources in higher education. 4 cr.

564. FIELD WORK
Supervised experience in approved recreation and park agencies. R&P Majors only. 4-8 cr. Cr/F.

661. RECREATION RESOURCES MANAGEMENT
Park practices as they relate to location, mangement, and maintentance. 4 cr.

663. RECREATION AND PARK ADMINISTRATION
Theoretical and practical methods used in attaining organizational goals. 4 cr.

664. SAFETY AND SECURITY OPERATIONS
Accident prevention and security procedures as applicable to recreation and park systems. 4 cr.

667. RECREATION AND RESOURCE PLANNING
Master planning concepts which relate to public systems. 4 cr.

668. DESIGNING AND ENGINEERING
Practices involved in constructing indoor and outdoor recreation facilities. 4 cr.

771. LEGAL ASPECTS
Basic legal aspects of leisure-oriented services. 4 cr.

772. FINANCIAL ADMINISTRATION
Business procedures which relate to municipal finance and budgeting techniques. 4 cr.

796. INDEPENDENT STUDY
Individual study and/or research relating to leisure-oriented topics. Variable 1-4 cr.

(798)798. SEMINAR IN LEISURE
Reviews of problems, trends, and current practices. 4 cr.

Reserve Officers Training Corps

(See Aerospace Studies and Military Science)

Resource Economics

(See Institute of Natural and Environmental Resources)

Russian

(See German and Russian)

Sanskrit

(See Spanish and Classics)

Secretarial Studies (SECR)

ASSOCIATE PROFESSORS: Doris E. Tyrell, emerita; Myra L. Davis

401-402. SHORTHAND
Principles of Gregg shorthand followed by dictation and transcription. Prerequisite: proficiency in typing or Sec. St. 405 or 407 taken concurrently. 4 cr.

405(405). PERSONAL USE TYPEWRITING
Practice in acquiring correct typewriting techniques, and in arranging letters and manuscripts. Open to students who do not know how to type. 2 cr. Cr/F.

407-408. TYPEWRITING
Beginning course, primarily for students interested in two semesters. 2 cr.

427. TYPEWRITING
To be taken instead of Sec. St. 407 by students who have had a personal-use typewriting course. Class begins at mid-semester. 1 cr.

Social Science (SCSC)

Courses coordinated by the Chairperson of the Social Science Division, Collge of Liberal Arts.

681(681). INTERNSHIPS
Field work in a state or local government department, agency, or institution, or in an approved private agency. Work will be under supervision of agency. Department chairperson or representative is responsible for arranging the program. Offered through departments of History, Political Science, Psychology, Sociology, or Anthropology, or the Whittemore School of Business and Economics. Prerequisite: senior standing. Variable to 16 cr.

Social Service (S S)

Chairperson: Pauline Soukaris

ASSOCIATE PROFESSOR: Pauline Soukaris
ASSISTANT PROFESSORS: Michael E. Hayes, Betty Holroyd Roberts, Thomas J. Viccaro

(522)522. INTRODUCTION TO SOCIAL WELFARE
U.S. governmental and voluntary programs, historical perspective and relation to social work. Public welfare, social insurance, and other income maintenance; their auspices, goals, services, staffing and clientele. Required for majors. Should be taken during sophomore year. 4 cr.

523(523). SOCIAL WELFARE PROGRAMS AND SERVICES
Child and family, school, correctional, mental, and medical social services; auspices, goals, services, staffing and clientele. Required for majors, should be taken during sophomore year. Prerequisite: S.S. 522 or permission of instructor. 4 cr.

(622)622. SOCIAL WORK PRACTICE I
Introduction to methods and practice. Basic principles, values, and ethics. Interviewing skills, problem assessment, social contracting. Skills training in lab sessions. Required for majors, should be taken in junior year. Prerequisite: S.S. 523 or permission of instructor. 4 cr.

623(623). SOCIAL WORK PRACTICE II
Continuation of S.S. 622. Delineation and study of intervention and change strategies differentiated with individuals, groups, and communities. Required for majors. Prerequisite: S.S. 622. 4 cr.

624. POVERTY AND SOCIAL WORK
Causes and consequences of urban and rural poverty; social welfare patterns, attitudes, and norms. Sociological and psychological theories of poverty; policies and decisions which inhibit the effectiveness of social work. Prerequisite: junior or senior standing. 4 cr.

631(631). SOCIAL WELFARE FIELD EXPERIENCE
Majors will be placed in a social welfare setting for a minimum of 300 hours, concurrent with a weekly seminar on campus; individual arrangements with faculty coordinator. Required for majors. Prerequisite: S.S. 623 and permission of instructor. 12 cr. Cr/F.

632. SPECIAL TOPICS IN SOCIAL WELFARE
Seminar for advanced majors. Topics may include income maintenance, alcoholism, health care, aging, child welfare, and mental health; to increase understanding of factors that influence program development and service delivery. Prerequisite: S.S. 631 or permission of instructor. 4 cr.

633. SEMINAR IN SOCIAL WORK METHODS
Analysis and comparison of change theories, intervention strategies, therapeutic techniques. Seminar format. Possible topics: techniques of group work, case work or community practice, behavior modification, crisis intervention, and staff development and supervison. Prerequisite: senior major standing. 4 cr.

(700). SOCIAL GERONTOLOGY
Theories, social problems, programmatic responses, and recent research on aging; emphasis on the psycho-social forces. Prerequisite: senior or graduate status or permission of instructor. 4 cr.

795,796. READINGS AND RESEARCH IN SOCIAL SERVICE
Independent work under Social Service faculty guidance. Prerequisites: 12 hours of Social Service and permission of instructor. Variable cr.

Sociology and Anthropology

Chairperson: Richard E. Downs

PROFESSORS: Melvin T. Bobick, Walter Buckley, Richard Dewey, Stuart Palmer, Solomon Poll, Murray A. Straus
ASSOCIATE PROFESSORS: Thomas Burns, Peter Dodge, Richard E. Downs, Bud B. Khleif, Arnold S. Linsky, Melville Nielson, Frederick Samuels, Howard Shapiro
ASSISTANT PROFESSORS: Charles E. Bolian, Loren Cobb, Stephen P. Reyna

Anthropology (ANTH)

411. CULTURAL AND SOCIAL ANTHROPOLOGY
Cultural and social aspects of human behavior, particularly in relation to non-industrial societies. Analysis of selected societies, institutions, and forms of social structure. 4 cr.

412. PHYSICAL ANTHROPOLOGY AND PREHISTORIC ARCHAEOLOGY
Man's physical evolution and his cultural prehistory; evolutionary theory and archaeological techniques. 4 cr.

512. INTRODUCTION TO WORLD ETHNOGRAPHY
Primarily for majors and minors but open to all students. Historical and geographic factors, types of social and economic organization, and problems involved in the comparative study of human societies and institutions. Analysis of selected peoples in the major ethnographic areas. Prerequisite: Anthro. 411 or equivalent, or permission of instructor. 4 cr.

514. METHOD AND THEORY IN ARCHAEOLOGY
Basic method and theory; techniques in recovering and interpreting data; laboratory exercises in ceramic and lithic analysis. Critcal evaluation of archaeological literature. Prerequisite: Anthro. 412 or permission of instructor. 4 cr.

614. ECONOMIC ANTHROPOLOGY
Economics of non-industrial societies; definition of economics; production, distribution, and consumption in selected societies; development. Prerequisite: Anthro. 411 or permission of instructor. 4 cr.

616. ANTHROPOLOGY OF RELIGION
Major anthropological theories of religion; analysis of religious beliefs as symbolic systems and their interrelations with ritual and other social institutions. Detailed study of specific religions. Prerequisite: Anthro. 411 or permission of instructor. 4 cr.

618. POLITICAL ANTHROPOLOGY
Political processes and structures in non-industrial societies. Major topics: centralization of power and authority, legal systems, and warfare. Prerequisite: Anthro. 411 or permission of instructor. 4 cr.

620. ANTHROPOLOGICAL LINGUISTICS
Thought systems as organized and communicated through language in its social context. Ethnographic semantics, symbolism, sociolinguistics. Prerequisite: Anthro. 411 or permission of instructor. 4 cr.

699. SENIOR THESIS
Independent work in the library or field; recommended for, but not confined to, majors intending to pursue graduate studies; required for honors candidates. Contact staff to obtain approval and arrange supervision. Should be taken next-to-last semester before graduation. 4 cr.

731,732. AREA STUDIES IN ARCHAEOLOGY
Offered as staff is available and student needs dictate. 1) South America: from earliest cultural remains to European contact; changing relationship of culture and environment emphasized. 2) Mesoamerica: earliest cultural remains through Olmec, Maya, Toltec, and Aztec; changing relationship of culture and environment. Prerequisite: Anthro. 412 and 514, or permission of instructor. 4 cr.

747(747). AREA STUDIES IN SOCIAL AND CULTURAL ANTHROPOLOGY
1) South America; 2) Mesoamerica; 3) North America; 4) Oceania; 5) Southeast Asia; 6) Africa; 7) Other. Offered as staff is available and student needs dictate. Characteristic ecological, historical, and socio-cultural factors. Analysis of selected societies and institutions. Prerequisite: Anthro. 411 or permission of instructor. 4 cr.

752. SOCIAL PROBLEMS IN MODERN AFRICA
Problems of change and development in Africa considered from the anthropological perspective. Prerequisite: Anthro. 411 or permission of instructor. 4 cr.

775. ANTHROPOLOGICAL THEORY
Major theoretical approaches in historical perspective. Prerequisite: Anthro. 411 or permission of instructor. 4 cr.

795,796. READING AND RESEARCH IN ANTHROPOLOGY
1) Cultural/social Anthropology; 2) Anthropological Linguistics; 3) Prehistoric Archaeology, 4) Physical Anthropology. Prerequisite: 12 credits of anthropology and permission of instructor. Variable cr.

Sociology (SOC)

400. INTRODUCTORY SOCIOLOGY
Man's social and cultural relationships as revealed in his customs and institutions. Social theory, methods and techniques of research, and current research findings. Laboratory-problem method of instruction is offered occasionally, students interested should register for the section identified as "Laboratory" in the Time-Room schedule. 4 cr.

500. SOCIAL PSYCHOLOGY
Individual actions, attitudes, ideas, and perceptions as influenced by socio-cultural environments. Individual-cultural relations in education, religion, economics, aesthetics, ethics, and deviant behavior. 4 cr.

520. THE FAMILY
An anthropological and institutional approach comparing societal customs and organizations. A laboratory-problem method of instruction is offered occasionally; students interested should register for the section identified as "Laboratory" in the Time-Room Schedule. 4 cr.

530. RACE AND ETHNIC RELATIONS
Majority-minority group relations; special attention to nature and results of Black-White and ethnic group relations in the United States. 4 cr.

540. SOCIAL PROBLEMS
Relation of customs and institutions to crime delinquency, alcoholism, physical and mental disease, sexual aberrations, poverty, old age, broken families, and racial and religious prejudices. Especially for non-majors. 4 cr.

560. RURAL-URBAN SOCIOLOGY
Application of sociological and social psychological principles to the study of populations at various points on the rural-urban continuum. 4 cr.

600. SOCIAL INSTITUTIONS
Relationships among education, religion, economy, government, paedotrophic and inter-sex practices, art, and recreation. Cross-cultural approach. 4 cr.

601. METHODS OF SOCIAL RESEARCH
Cross-sectional and longitudinal survey design; direct and indirect measurement techniques; design of field and laboratory experiments; special topics. Prerequisite: major in sociology or social service, or permission of instructor. 4 cr.

602. STATISTICS
Elementary applied statistical techniques; descriptive statistics, cross-tabulation, correlation, probability, hypothesis testing, analysis of variance. 4 cr.

611. HISTORY OF SOCIAL THEORY
Background and early formulation. Writings of classical social thinkers from Plato to Max Weber. 4 cr.

612. CONTEMPORARY SOCIOLOGICAL THEORY
Major schools of contemporary sociological theory; functionalism, "verstehen" sociology, symbolic interactionism, reform sociology, neo-positivism, and formal theory construction. 4 cr.

615. INTRODUCTORY CRIMINOLOGY
The scientific study and control of crime. Indexes rates, theories of crime and delinquency, police, courts, probation, prison, and parole. 4 cr.

629. SMALL GROUPS
Interaction among individuals in small groups and between small groups; perception, attitude, and behavior. Analytical techniques are applied. A prior course in social psychology is recommended. 4 cr.

699. SENIOR THESIS
Independent work in the library or field; recommended for, but not confined to, majors intending to pursue graduate studies; required for Honors candidates. Contact staff to obtain approval and arrange supervision. Should be taken next-to-last semester before graduation. 4 cr.

720. CURRENT DEVELOPMENTS IN SOCIOLOGY OF THE FAMILY
A current topic will be selected each semester, such as stratification and the family, intra-family communication, power structure of the family, kinship in modern societies. Critical review of the literature; class or individual research project will usually be carried out. Prerequisite: 8 credits of Soc.; Soc. 520 recommended. 4 cr.

721. FAMILY INTERACTION
Influence of family interaction on human behavior. Self, interactionist, and role approach. Analysis of research. Prerequisite: 8 credits of Soc. and/or Psych; Soc. 500 recommended. 4 cr.

735. COMPLEX ORGANIZATIONS
Comparative study of the structure and dynamics of complex, formal organizations (business, military, political and governmental, educational, medical). Power and social control in formal systems; organizational processes, performances, and effectiveness; impact of complex, formal organizations on persons and societies. Prerequisite: permission of instructor. 4 cr.

740. CULTURE CHANGE
Various types of society; development of theory. Descriptive studies of institutional as well as theoretical materials selected from the writing of Comte, Marx, Spencer, Durkheim, Spengler, Sorokin, Redfield, and others. 4 cr.

741. SOCIAL CHANGE AND SOCIETAL DEVELOPMENT
Comparative, interdisiplinary approach. Interrelationships among economic, political, and social factors in determining the structure, dynamics, character, and level of development of societies. Prerequisite: permission of instructor. Soc. 740 recommended. 4 cr.

745. SOCIAL STRATIFICATION
The pattern of distribution of economic, honorific, and political variables within the populations of complex societies; the allocation of personnel to the roles in question, notably through occupational mobility; and the impact of such processes upon behavior, both individual and social. Prerequisite: Soc. 400 or 600. 4 cr.

757. SOCIAL INSTITUTIONS OF LATIN AMERICA AND THE CARIBBEAN
Selective analysis of distinctive institutions and social systems, with particular attention to social aspects of the process of modernization. Prerequisite: permission of instructor. 4 cr.

761. POPULATION DYNAMICS
Major population trends including changes in birth and death rates, population characteristics, mobility; migration, world population growth, population problems, and policies of countries at different stages of economic development. Interrelationship of population and society. 4 cr.

770. CULTURE, PERSONALITY, AND SOCIETY
A cross-cultural view of the development of personality as emergent from genetic, situational, and sociocultural determinants; analysis of the dynamic interplay of sociocultural and psychological behavior systems. Prerequisite: prior courses in sociology, anthropolgy, or psychology. 4 cr.

780. SOCIAL CONFLICT
The nature of social conflict, especially war. The setting and initiation of conflict, its dynamics, and the factors affecting its course and outcome. Prerequisite: permission of instructor. 4 cr.

785. THE STUDY OF WORK
Understanding society through the structure of work. Case studies, in an ethnographic manner, of high-status and low-status occupations to provide understanding of social processes and interrelationships in the social structure. Prerequisite for graduate students: permission of instructor. 4 cr.

790. APPLIED SOCIOLOGY
1) Current level of use of sociological knowledge; 2) the advocate, consultant, and researcher roles in applied settings; 3) techniques of applied research; 4) implications of applied sociology, including ethical problems. Each student will focus on a social problem and write a paper covering the above issues. Applied projects where possible. Prerequisite: Soc. 601. 4 cr.

795,796. READING AND RESEARCH IN SOCIOLOGY
1) Communications; 2) criminology; 3) culture change; 4) culture and personality; 5) deviant behavior; 6) family; 7) population; 8) rural-urban; 9) social control; 10) social differentiation; 11) social movements; 12) social psychology; 13) social research; 14) social theory. Prerequisite: 12 credits of sociology and permission of instructor. Variable cr.

Soil and Water Science

(See Institute of Natural and Environmental Resources)

Spanish and Classics

Chairperson: John C. Rouman

PROFESSORS: John S. Walsh, emeritus; R. Alberto Casás, Warren H. Held, Charles H. Leighton
ASSOCIATE PROFESSORS: Richard J. Callan, John C. Rouman
ASSISTANT PROFESSORS: Richard V. Desrosiers, F. William Forbes, Lois Grossman
VISITING ASSISTANT PROFESSOR: Bernadette Komonchak
ASSISTANT CHAIRPERSON FOR SPANISH: F. William Forbes

Classics (CLAS)

512. GREEK AND LATIN LITERATURE IN TRANSLATION
The dimensions of the ancient Greco-Roman civilization from which so much of our contemporary culture derives. For the student unprepared to read Greek and Latin. Background course for majors in English, History, Latin, Greek, and the modern languages and literatures. 4 cr.

521,522. MASTERPIECES OF GRECO-ROMAN CULTURE IN TRANSLATION
More advanced study of the writings of classical civilizations. For students with some classical preparation. Background course for majors in English, History, Latin, Greek, or the modern languages and literatures. 4 cr.

595,596. TOPICS IN CLASSICS
1) Classical mythology; 2) Greek and Latin origins of medical terms; 3) Greek and Latin origins of legal terms; 4) Greek and Latin origins within the English language; 5) Hellenic institutions; 6) Roman institutions; 7) Classical backgrounds of modern literature; 8) Sanskrit; 9) Classical archaeology. Introduction and elementary study of the above topics related to linguistic study of Latin and Greek or relevant to Greco-Roman culture and history. Primarily for students unprepared to read Latin or Greek. 2 or 4 cr.

605. INTRODUCTION TO COMPARATIVE AND HISTORICAL LINGUISTICS
Survey. Subjects include comparative linguistics, a short history of linguistics, phonetics, phonemics, language families, types of grammars, methods of writing, etc. Some language training is desirable. 3 rec/4 cr.

695,696. SPECIAL STUDIES IN CLASSICS
Advanced work in classics. Research paper. Not open to freshmen and sophomores. 2 or 4 cr.

Greek (GREK)

New students will be assigned to proper course on basis of scores on College Board Achievement test. Transfer credit will not be given for elementary level college courses in foreign languages if student has had two or more years of the foreign language in secondary school.

401-402. ELEMENTARY GREEK
Grammar, simple composition, and translation. (No credit for students who have had two or more years of Greek in secondary school; however, any such student, whose study of this foreign language has been interrupted for a significant period of time, should consult the department chairperson about possibly receiving credit.) 5 rec/4 cr.

503-504. INTERMEDIATE GREEK
Readings from Xenophon, Plato, Herodotus, Euripides, and the New Testament. Prerequisite: Greek 402. 4 cr.

601-602. GREEK PROSE COMPOSITION
Review of Attic Greek grammar; study of Greek prose style; English to Greek translation. Prerequisite: permission of instructor. 4 cr.

751,752. HOMER AND THE ARCHAIC PERIOD
Readings from the "Iliad," the "Odyssey," the Homeric Hymns, Hesiod, Pindar, and the Lyric Poets. Prerequisite: permission of instructor. 4 cr.

753,754. ADVANCED STUDIES IN ATHENIAN LITERATURE
1) Aeschylus; 2) Sophocles; 3) Euripides; 4) Aristophanes; 5) Herodotus; 6) Thucydides; 7) Xenophon; 8) Plato; 9) Aristotle; 10) Lysias; 11) Demosthenes; 12) Isocrates. Major Attic authors from the Battle of Marathon to the death of Alexander the Great. Prerequisite: permission of the instructor. 4 cr.

795,796. SPECIAL STUDIES IN GREEK
1) Pre-Socratic Philosophers; 2) Hellenistic Greek Authors; 3) Menander; 4) Callimachus; 5) Apollonius of Rhodes; 6) Theocritus; 7) Polybius; 8) Greek Authors of the Roman Empire; 9) Plutarch; 10) Septaugint; 11) New Testament; 12) Greek Church Fathers; 13) Byzantine Authors; 14) Spoken Greek; 15) Advanced Greek Composition; 16) Introduction to Classical Scholarship; 17) Greek Epigraphy; 18) Greek Dialects; 19) Comparative Grammar of Greek and Latin; 20) Homer: A Linguistic Analysis; 21) Greek Institutions; 22) Palaeography and Textual Criticism. Topics selected by instructor and student in conference. Prerequisite: permission of instructor. 2 or 4 cr.

Latin (LATN)

New students will be assigned to proper course on basis of scores on College Board Achievement test. Transfer credit will not be given for elementary level courses in foreign languages if student has had two or more years of the foreign language in secondary school.

401-402. ELEMENTARY LATIN
Elements of grammar, reading of simple prose. Course cannot be counted for major credits. (No credit for students who have had two or more years of Latin in secondary school; however, any such student, whose study of this foreign language has been interrupted for a significant period of time, should consult the department chairperson about possibly receiving credit.) 5 rec / 4 cr.

501. INTERMEDIATE LATIN
Similar to Latin 503 (below), but for students continuing from Latin 402 whose preparation does not qualify them for Latin 503. Intensive review of Latin grammar and vocabulary; readings in prose and poetry. Prepares for Latin 504. Completion of 501 fulfills foreign language requirement for B.A. degree. 4 cr.

503-504. INTERMEDIATE LATIN
Review. Readings from Cicero, Caesar, Sallust, Livy, Catullus, Horace, Ovid, Plautus, Terence, and Seneca. Prerequisite: Latin 402 or equivalent. 4 cr.

601-602. LATIN PROSE COMPOSITION
Grammar review; study of Latin prose style; English to Latin translation. Prerequisite: permission of instructor. 4 cr.

751,752. CICERO AND THE ROMAN REPUBLIC
Prerequisite: permission of instructor. 4 cr.

753,754. ADVANCED STUDIES IN THE LITERATURE OF THE GOLDEN AGE
1) Lucretius; 2) Catullus; 3) Caesar; 4) Sallust; 5) Vergil, 6) Horace; 7) Tibullus; 8) Propertius; 9) Ovid; 10) Livy. Major Roman authors from the dictatorship of Sulla to the death of Augustus. Prerequisite: permission of instructor. 4 cr.

755,756. ADVANCED STUDIES IN THE LITERATURE OF THE SILVER AGE
1) Seneca the Younger; 2) Persius; 3) Petronius; 4) Lucan; 5) Statius; 6) Quintilian; 7) Martial; 8) Juvenal; 9) Tacitus; 10) Pliny the Younger. Major Roman authors from the reign of Nero to the death of Trajan. Prerequisite: permission of instructor. 4 cr.

791. METHODS OF FOREIGN LANGUAGE TEACHING—LATIN
Interdepartmental course. Objectives, methods, and techniques in teaching Spanish, French, German, and Latin from elementary grades through college. Discussion, demonstration, preparation of instructional materials, micro-teaching of the language skills. Prerequisite: permission of the instructor. (Same as Fr. 791, Ger. 791, and Span. 791.) 4 cr.

795,796. SPECIAL STUDIES IN LATIN
1) Minor Authors of the Republic; 2) Plautus; 3) Terence; 4) Minor Authors of the Empire; 5) Suetonius; 6) Latin Church Fathers; 7) Medieval Latin; 8) Advanced Latin Composition; 9) Introduction to Classical Scholarship; 10) Latin Epigraphy; 11) Italic Dialects; 12) Comparative Grammar of Greek and Latin; 13) Roman Law. Topics selected by instructor and student in conference. Prerequisite: permission of Instructor. 2 or 4 cr.

Spanish (SPAN)

New students will be assigned to proper course on basis of scores on College Board Achievement test. Transfer credit will not be given for elementary level college courses in foreign languages if student had two or more years of foreign language in secondary school. No student educated in a foreign country will be permitted to register for any Spanish course numbered 650 or below if Spanish is the student's native language. All courses conducted in Spanish (or Portuguese) except where noted.

401-402. ELEMENTARY SPANISH
For students without previous knowledge of Spanish. Aural-oral practice; fundamental speech patterns; reading and writing to achieve a firm basis for an active command of the language. No credit toward a major. (No credit for students who have had two or more years of Spanish in secondary school; however, any such student, whose study of this foreign language has been interrupted for a significant period of time, should consult the department chairperson about possibly receiving credit.) 5 rec / 2 lab / 4 cr.

403-404. ELEMENTARY PORTUGUESE
For students without previous knowledge of Portuguese. Aural-oral practice; fundamental speech patterns; reading, and writing to achieve a firm basis for an active command of the language. No credit toward a major. (No credit for students who have had two or more years of Portuguese in secondary school; however, any such student, whose study of this foreign language has been interrupted for a significant period of time, should consult the department chairperson about possibly receiving credit.) 5 rec / 2 lab / 4 cr.

407. ACCELERATED SPANISH
Spanish 401-402 in one semester. Study of fundamental speech patterns, reading and writing to achieve a firm basis for active command of Spanish. Previous knowledge of Spanish is not required. (No credit for students who have had two or more years of Spanish in secondary school; however, any such student, whose study of this foreign language has been interrupted for a significant period of time, should consult the department chairperson about possibly receiving credit.) Required lab/8 cr.

501. INTERMEDIATE SPANISH
Similar to Spanish 503, but for students continuing from Spanish 402 and whose preparation does not qualify for Spanish 503. Aural-oral practice; review of basic structure; reading, and writing to develop active command of the language. No credit toward a major. Students with a final grade of B or better may register for Spanish 504, with permission of instructor. Completion of 501 fulfills foreign language requirement for the B.A. degree. 5 rec/1 lab/4 cr.

503-504. INTERMEDIATE SPANISH
Complete literary texts of intellectual worth; review of language structure; oral and written expression of ideas. Discussion and papers in Spanish. Open by placement examination, and to students who have passed Spanish 402 with a C. Students making A in Spanish 504 may take courses numbered 750 and above with the permission of the department. No credit toward the major for 503. 4 rec/1 lab/4 cr.

507-508. INTERMEDIATE PORTUGUESE
Conversation/composition based on readings in contemporary Portuguese and Brazilian literature, especially theater which is closest to conventional language. A traditional grammar text supplements reading. 3 lec/1 lab/4 cr.

525. SPANISH CIVILIZATION AND CULTURE
Historical, geographical, and artistic expressions of Spanish civilization that have formed the character of contemporary Spanish culture. Readings; slides, films, tapes, and records. Conducted in English. Required of majors. 4 cr.

601(601). SPANISH PHONETICS
Practical application of fundamental phonetic theory to spoken Spanish. Two hours per week plus lab. Required of Spanish majors. 2 cr.

621. SPANISH AND PORTUGUESE LITERATURE IN TRANSLATION
Major works by principal authors; Camoens, Cervantes, Lope de Vega, Calderón, Eça de Queiroz, Unamuno, Ortega y Gasset, García Lorca, Casona, etc. Readings, discussions, papers in English. Does not count for Spanish major. 4 cr.

622. SPANISH AMERICAN AND BRAZILIAN LITERATURE IN TRANSLATION
Major works by principal authors; Inca Garcilaso, Diaz del Castillo, Machado de Assis, Borges, Asturias, Neruda E. Veríssimo, Fuentes, Leñero, Guimarães Rosa, and Jorge Amado. Readings, discussion, papers in English. Does not count toward Spanish major. 4 cr.

631,632. ADVANCED SPANISH CONVERSATION AND COMPOSITION
To maintain and perfect written and spoken Spanish through intensive classroom work, individual conferences, and laboratory sessions. Prerequisite: Span. 503 or 504 or equivalent. 4 lec/2½-hr. lab/4 cr.

651,652. INTRODUCTION TO SPANISH LITERATURE AND THOUGHT
Reading and analysis of significant works; historical and cultural background reading. Papers and discussion in Spanish. Concurrent enrollment in 631, 632 recommended. This course or its equivalent is prerequisite to all higher courses in Spanish. Open to students with grade of C or better in Span. 504, and by placement examination. 4 cr.

665,666. SPANISH AMERICAN LITERATURE
Main literary themes of representative authors against the historical social, and geographical background of the New World. Prerequisite: Span. 504 or equivalent. Concurrent enrollment in Span. 631, 632 recommended. 4 cr.

685,686. JUNIOR YEAR ABROAD
Program of studies at a Spanish or Spanish-American university for juniors, who have completed sophomore year at UNH and passed Spanish 503-504 or equivalent with grade of B or better. Students required to take non-credit orientation meetings during the semester prior to departure. Interested students should consult with the program directors. Variable to 16 cr. per semester.

691,692. READINGS IN CURRENT PERIODICALS
Advanced practice in reading, speaking, and writing, based on current events in contemporary periodicals of the Spanish-speaking world. Co- or prerequisite: Span. 632 or equivalent. May be repeated. 2 cr.

752. DRAMA AND POETRY OF THE SIGLO DE ORO
Social and historical background of Baroque period. Representative plays of Lope de Vega, Tirso de Molina, Calderón; lyric poetry of Lope, Góngora, and Quevedo; prose developments. 4 cr. (Not offered every year.)

754. CERVANTES
Cervantes' literary art. Selections from the major works. The Quijote, its originality and significance; its antecedents; its religious, philosophical, and sociological aspects; and its artistic structure. Prerequisite: Span. 652 or 666 or equivalent. 4 cr. (Alternate years.)

755. LITERATURE OF THE 19TH CENTURY
Larra, Espronceda, Bécquer, Pérez Galdós, and Blasco Ibáñez. Romanticism, realism, and naturalism. 4 cr. (Alternate years.)

757. THEATER AND POETRY OF THE 20TH CENTURY
The Generation of 1898 and *Modernismo:* Lorca, Casona, Buero Vallejo, Sastre, Salinas, Guillén, and Miguel Hernández. 4 cr.

758. SPANISH PROSE OF THE 20TH CENTURY
Novels, short stories, and essays. Unamuno, Baroja, Menendez Pidal, Ortega y Gasset, Julián Mariás, Aranguren, Peréz de Ayala, Gironella, and Cela; survey of contemporary prose. Prerequisite: Span. 652 or 666 or equivalent. 4 cr. (Alternate years.)

760. UNAMUNO AND ORTEGA Y GASSET
Philosophical ideology and literary content of major contributions of Miguel de Unamumo and José Ortega y Gasset. Prerequisite: Span. 652 or 666 or equivalent, or permission of instructor. 4 cr. (Alternate years.)

771. SPANISH-AMERICAN DRAMA
From pre-Hispanic origins to the present, modern playwrights of Mexico and Puerto Rico. Prerequisite: Span. 652 or 666 or equivalent. 4 cr. (Alternate years.)

772. SPANISH-AMERICAN NOVEL
Development from Romanticism to the present; contemporary trends and techniques. Prerequisite: Span. 652 or 666 or equivalent. 4 cr. (Alternate years.)

773. SPANISH-AMERICAN SHORT STORY
Representative authors; stress on 20th century. Principles of interpretation. Prerequisite: Span. 652 or 666 or equivalent. 4 cr. (Alternate years.)

774. MAJOR SPANISH-AMERICAN AUTHORS
Works and life of some six writers; pertinent historical circumstances. Prerequisite: Span. 652 or 666 or equivalent. 4 cr. (Alternate years.)

791. METHODS OF FOREIGN LANGUAGE TEACHING—SPANISH
Interdepartmental course. Objectives, methods, and techniques in teaching Spanish, French, German, and Latin from elementary grades through college. Discussion, demonstration, preparation of instructional materials, micro-teaching of the language skills. Prerequisite: permission of the instructor. (Same as Fr. 791, Ger. 791, and Latin. 791.) 4 cr.

795,796. SPECIAL STUDIES IN SPANISH LANGUAGE AND LITERATURE
1) The history of the Spanish language; 2) Medieval Spanish literature; 3) Spanish literature of the Renaissance; 4) Spanish literature of the Golden Age; 5) Spanish literature of the 18th and 19th centuries; 6) Spanish literature of the 20th century (1898-1936); 7) Contemporary Spanish literature; 8) Spanish American literature of the 16th and 17th centuries; 9) Spanish American literature of the 18th and 19th centuries; 10) Spanish American literature of the 20th century; 11) Contemporary Spanish American literature; 12) Structural and applied linguistics; 13) Spanish Literary Critcism; 14) Spanish American Essay; 15) Latin America; 16) Catalan; 17) Spanish American Poetry; 18) Spanish poetry; 19) Galdos; 20) Archetype Latin American Literature; 21) Special Teaching Problems; 22) Spanish Civilization and Culture; 23) Latin-American Civilization and Culture; 24) Borges; 25) Spanish Theater. 26) Spanish for Graduates (two-semester course must be taken in sequence); 27) Hispanic minorities of the United States; 28) Portuguese. Guided study with training in bibliography and organization of material. Topics selected by instructor and student in conference. Prerequisite: permission of major supervisor. 2 or 4 cr.

Speech and Drama (SPDR)

Chairperson: David J. Magidson

PROFESSOR: Joseph D. Batcheller
ASSOCIATE PROFESSORS: John C. Edwards, David J. Magidson
ASSISTANT PROFESSORS: Raymond J. Bernier, Jean M. Brown, Carol Lucha Burns, Gilbert B. Davenport, Richard D. Halley, Wilburn Sims
INSTRUCTOR: Tracey Bernstein Weiss
LECTURERS: Patricia Fleming, Susan Goldin, Jean Mattox, Linda Luca, Judith Hartwell, Allegra May, Maurice Quirin, Thomas Scharff

Communications

(402)402. COMMUNICATIONS I
Interpersonal and intrapersonal. Student's awareness of his/her role in communication. Open to freshmen and sophomores. 2 lec/1 lab/4 cr.

403(403). PUBLIC SPEAKING
Sensitizes speakers and listeners; understanding and adapting to receivers, idea selection and development, message organization, and delivery. Nonverbal communication. 4 cr.

404. INTRODUCTION TO ARGUMENTATION
Principles of inquiry and advocacy. Philosophical and logical frameworks of argument; analysis, discovery and testing of data; forms of argument; testing of argument; patterns of proof and evidence. Argumentation as advocacy. This course is a prerequisite for S & D 405 and 501. 4 cr.

405(405). ARGUMENTATION WORKSHOP
Basic principles of rational decision-making through argumentation. Application in debate formats. May be repeated. Prerequisite: S.D. 404. 2 cr.

421. PROBLEMS IN HUMAN LISTENING BEHAVIOR
Listening processes, evaluation of accuracy, improvement programs, and pitfalls. Practice in experimental techniques.4 cr. (Alternate years; offered 1977-78.)

501. ARGUMENTATION II
Argument and advocacy as action on minds by means of discourse. Presumptions, hierarchies, loci, presentation of data and the form of the discourse, ethical and logical duties of the advocate. Examinations of arguments by politicians, lawyers, or others who advance propositions of fact, value, or policy. Prerequisite: S.D. 404, 405, or permission of instructor. 4 cr.

503. INTRODUCTION TO GROUP PROCESSES
Communications behavior in small groups. Problem-solving procedures, leadership, behavioral patterns, communications interaction patterns. Prerequisite: S.D. 402 or 403, or permission of instructor. 4 cr.

506. PERSUASION
Advanced public speaking course on problems of influencing human behavior. Practical applications. Prerequisite: S.D. 403 or permission of instructor. 4 cr.

555. INTRODUCTION TO MASS COMMUNICATIONS
Nature, development, and effects on our society. Television effects and production techniques. Limited studio work. Prerequisite: permission of instructor. 4 cr.

556. INTRODUCTION TO TELEVISION PRODUCTION
Theory and actual studio experience, practice and procedures. All aspects of television work and formats. Students operate every piece of studio equipment and write, produce, and direct several shows. Prerequisite: S.D. 555 or permission. 4 cr.

572. LANGUAGE AND BEHAVIOR
The human symbol-using capacity and the effects of language on behavior. Ways in which symbols help create individual realities, reflect levels of personal judgement and adjustment, facilitate or hinder interpersonal communication. Application to verbal and non-verbal communication, contemporary and social issues. 4 cr.

608. ADVANCED SPEECH COMPOSITION
Development and application of rhetorical strategies in preparation and presentation of oral messages. Writing and speaking workshop. Recommended: S. and D. 403. (Alternate years; offered 1977-78.) 4 cr.

630. PSYCHOLOGY OF COMMUNICATION
Concept-reference; vocal, visual, and verbal cues and attention. (Alternate years; offered 1976-77.) 4 cr.

656. PRINCIPLES OF RHETORICAL CRITICISM
Roles and methods of rhetorical critics. Historical background to rhetorical-critical structures and processes including neo-Aristotelian criticism and Burkeian criticism. Critical principles and practices. Seminar. Prerequisite: S. and D. 403 or permission of instructor. 4 cr.

671. CRITICISM OF CONTEMPORARY RHETORIC
Applies rhetorical-critical systems and principles. Campaign rhetoric, agitative rhetoric, the rhetoric of religion, the rhetoric of militarism, the rhetoric of diplomacy, and the rhetoric of social movements. Course content variable. Prerequisite: S. and D. 656 or permission of instructor. 4 cr.

673(673). EXPERIMENTAL AND DESCRIPTIVE STUDIES IN ORAL COMMUNICATION
4 cr. (May be repeated.) Permission required.

681. THEORIES OF LANGUAGE
Nature, uses, and roles of language. Representative theorists include Carroll, Piaget, Sapir, Whorf, Vetter, Vygotsky, Wiener, Chomsky, Labov, Stewart, Ogden and Richards, Ruesch, and Sullivan. Prerequisite: permission of instructor or S. and D. 572 and 673. 4 cr. (Alternate years; offered 1977-78.)

695(695). SPECIAL TOPICS IN COMMUNICATIONS
Individual or group projects primarily in the Communication option. By permission and arrangement with appropriate faculty. (May be repeated.) Variable 2, 4, 6, or 8 cr.

750. WRITING FOR PERFORMANCE
See Theater offerings. 4 cr.

Dance

460. MODERN DANCE
Technique and improvisation. Open only to Physical Education majors. 2 lab/1 cr.

461. MODERN DANCE I
An introductory course which includes techniques and improvisation as well as lectures in history and theory. 1 lec/3 lab/4 cr.

462. MODERN DANCE II
Intermediate level course which includes techniques and improvisation. (May be repeated for credit.) Prerequisite: S. and D. 461 or permission of instructor. 3 2-hr. lab/2 cr.

463. MODERN DANCE III
Advanced level course in technique and composition. (May be repeated for credit.) Prerequisite: S. and D. 462 or permission of instructor. 5 1½-hr lab/2 cr.

464. BALLET I
Introductory course; technique; historical development of ballet. 1 lec/3 lab/4 cr.

467. THEATER DANCE I
Introductory course; technique; impovisation; lecture on jazz, ethnic, and other theatrical dance forms. 1 lec / 3 lab / 4 cr.

470. THEATER MOVEMENT
Stage movement for actors. Open to theater majors only. 2 cr.

532. LABANOTATION
Study and practice of recording human movement by the method of Labanotation. Prerequisite: permission of instructor. Variable 2-4 cr.

533. DANCE COMPOSITION I
Practical, developmental approach to process of creating dances. Prerequisite: S. and D. 462 or permission of instructor. 2 cr.

534. DANCE COMPOSITION II
Use of music; group choreography. Prerequisite: S. and D. 533. 2 cr.

584. SPECIAL TOPICS IN DANCE
Exploration of topics agreed upon by students and instructor. (May be repeated.) Topics vary. 2-4 cr.

632. CHOREOGRAPHY
A theoretical and practical consideration of the creative and aesthetic aspects of various forms of the dance. Prerequisite: S. and D. 462 or 465 or permission of instructor. 1 lec/2 lab/4 cr.

638. THE DANCE
An historical and philosophical consideration of dance trends. 3 lec/4 cr.

Theater

435. THEATER AND ITS DRAMA I (INTRODUCTION TO THEATER)
Emphasis upon modern theater. Survey of theater areas, personnel, and methods. Attendance at University Theater and Allied Arts productions. Minimal participation in laboratory and major productions. 4 cr.

436. THEATER AND ITS DRAMA II (HISTORY OF THEATER)
History and theory in its social framework from the beginnings to 1800. (Alternate years; offered 1977-78.) 4 cr.

438. THEATER AND ITS DRAMA III (HISTORY OF THEATER)
1800 to present. (Alternate years; offered 1977-78.) 4 cr.

441. VOICE AND DICTION I
Based on individual needs; particular reference to theater, television, radio. Individual and group practice sessions. Prerequisite: permission of instructor. 2 cr.

442. VOICE AND DICTION II
Basic skills for oral interpretation, theater, etc., including analysis and development of dialects. Prerequisite: S. and D. 441. 2 cr.

457. ORAL INTERPRETATION
Analysis of literature for performance; demonstration and experimentation with performance methods; development of a critical standard for evaluation of performance and literature. 2 lec/2 lab/4 cr.

459(459). SCENIC ARTS I (STAGECRAFT)
Stage scenery construction and painting. Properties, sound, and backstage organization. Survey of costumes and lighting. Practical application in University Theater productions. 4 cr.

475(475). STAGE MAKE-UP
Fundamentals of juvenile, old age, character and special stage make-up techniques. Prerequisite: permission of instructor. Lab fee: $10. 2 cr.

481. SUMMER REPERTORY THEATER WORKSHOP
1) Classes in voice, movement, make-up, and improvisation taught by the directors and professional actors of the resident company. 2) Technical aspects of scenery, costumes, lighting, publicity. 3) Performance in Summer Theater production with experienced resident actors. Admission to workshop by audition only. Offered in the eight-week summer session. 8 cr.

541. THEATER PUBLICITY
Practical application to University Theater and other assigned productions. Suggested background: S. and D. 435. Prerequisite: permission of instructor. 2 cr.

542. BOX OFFICE AND HOUSE MANAGEMENT
Box office procedure and house management. Practical application to University Theater and other assigned productions. Suggested background. S. and D. 435. Prerequisite: permission of instructor. 2 cr.

547(547). SCENIC ARTS II (STAGE COSTUME DESIGN AND EXECUTION)
Costume history, styles, design theory, pattern-making, and construction. Prerequisite: permission of instructor. 4 cr.

549(549). SCENIC ARTS III (STAGE LIGHTING DESIGN AND PRACTICE)
Elementary electricity, design theory, instrumentation, control, and practice. 4 cr.

551. REHEARSAL AND PERFORMANCE I (IMPROVISATION)
Development of fundamental vocal and physical stage techniques for actors and directors through exercises, improvisation, and theater games. Should be taken concurrently with S. and D. 441. 2 cr.

552. REHEARSAL AND PERFORMANCE II (CHARACTERIZATION)
Application of prior training in S. and D. 551 (prerequisite) to building characterizations in scenes and short plays. Should be taken concurrently with S. and D. 442. 2 cr.

565. MUSICAL COMEDY WORKSHOP
Emphasis on improving audition and performance techniques. By audition only. 4 cr.

575. SCENIC ARTS IV (FUNDAMENTALS OF SCENE DESIGN)
Stage drafting, modules, materials, design theory, and styles. Individualized exercises, final project. Prerequisite: S. and D. 459. Recommended. S. and D. 549. 4 cr.

620(620). EDUCATION THROUGH DRAMATIZATION
Puppetry, story-telling, involvement theater, and story theater for children; application to the classroom, playground, recreation center library, hospital ward. Prerequisite: permission of instructor. 4 cr.

621. CREATIVE DRAMATICS
Pantomime, improvisation, and story telling. Students are expected to work with the Durham Drama for Youth program. Prerequisite: S. and D. 620. 4 cr.

622. THEATER FOR CHILDREN
The art of children's theater production for both school and recreation programs. Students will observe and take part in the production of a play for children. 4 cr.

623. THEATER FOR CHILDREN—PUPPETRY
All materials and techniques necessary for a successful children's production. Prerequisite: permission of instructor. 4 cr.

624. THEATER AND MUSICAL PRODUCTION FOR CHILDREN
Musical production and writing techniques. 4 cr.

627. METHODS OF EDUCATION THROUGH DRAMATIZATION
Materials and technique practicum for teaching material in S. and D. 620. (Div. of Cont. Ed. only) Prerequisite: permission of instructor. 4 cr.

629. COMMUNITY ORIENTED CHILDREN'S DRAMA PROGRAMS
Students work in a community. 4 cr.

641. PLAY ANALYSIS FOR PRODUCTION
Analysis and discussion to develop production concepts for actors, technicians, directors, designers, teachers. Prerequisite: S. and D. 435, 436, or 438 and either 459, or 551 and 552. (Alternate years; offered 1977-78.) 4 cr.

652. SCENIC ARTS V (PRODUCTION DESIGN)
Full production plans, detail drawings, schedules for a hypothetical theater of the student's own design. Prerequisite: S. and D. 459, 547, and 549. 4 cr.

654(654). PERFORMANCE PROJECT
Application of acting and directing theory to assigned responsibilities in a University Theater production or to an individual performance project. Prerequisite: S. and D. 551, 552. To be taken in conjunction with S. and D. 655, but not concurrently. 2 cr. May be repeated to 4 cr.

655(655). SCENIC ART PROJECT
Application of experience in design and technical aspects to assigned responsibilities in a University Theater production or to an individual project or presentation. Prerequisite: S. and D. 459, 652. To be taken in conjunction with S. and D. 654, but not concurrently. 2 cr. May be repeated to 4 cr.

657. REHEARSAL AND PERFORMANCE III (DIRECTING)
Continuation of S. and D. 552 (prerequisite). The director and performer develop interaction of character. Ensemble playing. Full directing responsibility for a one-act play. 4 cr.

658. REHEARSAL AND PERFORMANCE IV (STYLES)
Continuation of S. and D. 657 and of the sequence begun in S. and D. 551 and 552. Styles of drama for the actor and director. Greek, Shakespearean, 18th century comedy, and 19th century realism. Prerequisites: S. and D. 551 and 552, 657, or equivalent. 4 cr.

668. GROUP INTERPRETATION
Choric speaking, reader's theater, chamber theater, and other forms of group interpretation in theory and practice. Prerequisite: S. and D. 457. 4 cr.

693. THEATER MANAGEMENT
Organization, public relations, business, and box-office management of University Theater projects. Special topics may be explored. Prerequisite: four courses in theater. (Alternate years.) 4 cr.

750. WRITING FOR PERFORMANCE
Playwriting; radio, television, and film. Emphasis will vary. Focus on original work with possible performances in other classes. May be taken three times for credit. Prerequisite: permission of instructor. 4 cr.

781. THEATER WORKSHOP FOR TEACHERS
Intensive seminar-workshop. Rehearsal techniques, theater production, and stage direction; work in lab and in summer repertory theater production as applicable to secondary-school theater. Offered in the summer session. 4 cr.

782. THEATER WORKSHOP FOR TEACHERS
Continuation of S. and D. 781 (not a prerequisite). Offered in the summer session. 4 cr.

General

691(691). LABORATORY OR FIELD EXPERIENCE
Taken in the senior year. 4 cr.

697(697). SENIOR SEMINAR I
Divisional and departmental meetings as preparation for senior project; overview of recent developments and trends in the oral-communication arts and sciences. Prerequisite: senior standing. 2 cr.

698(698). SENIOR SEMINAR II
Further development and completion of senior project. Prerequisite: senior standing. 2 cr.

795(795),(796)796. INDEPENDENT STUDY
Application of speech communication theory in individual or group projects. Could be combined with the senior project (for majors) for a total of 12 credits in the same semester if the student wishes to study off-campus. Project is to be developed with supervising instructor. May be repeated. Variable credits of 2, 4, 6, or 8.

Technology (TECH)

Dean: Richard S. Davis

405. INTRODUCTION TO COMPUTER TECHNOLOGY AND APPLICATIONS
Computer hard- and software; demonstrations, some "hands-on" experience with hardware, and some experience with hardware, and some programming. Advantages and limitations of computers with respect to various applications (e.g., data processing, automation, education); impact on society (e.g., employment, privacy, war). No credit subsequent to Math 410, 510, E.E. 712, 724. 3 lec/1 rec/4 cr.

455. HOW ELECTRICAL THINGS WORK
Survey course for the completely uninitiated student. Qualitative understanding of the electrical and magnetic principles of commonly encountered technology in the household and automobile. Diagnosis and repair of simple household electrical problems in wiring and small appliances; automotive electrical problems in ignition system, generation system, and starting system. Laboratory: typical equipment measured while in operation and disassembled, to show the principles of design, diagnosis, and repair. Open for credit to non-College of Engineering and Physical Science students only. 2 2-hour lec-dem / lab-dem / 4 cr.

601. STATISTICAL METHODS IN ENGINEERING AND PHYSICAL SCIENCE
Organizing data and statistical techniques for data analysis. Elementary probability theory, probability distributions, tests of significance correlation, and regression analysis. Design of experiments; completely randomized blocks; factorials, fractional factorials; process optimization. Introduction to quality control. 4 cr.

610. INTRODUCTION TO OCEAN ENGINEERING
Seminar dealing with engineering problems in fields of current oceanographic interest. Marine biology, saturation diving systems, and physical oceanography. Engineering faculty and other experts in ocean science and engineering. Prerequisite: permission of instructor. 4 cr.

683. TECHNOLOGY: ITS ROLE AND FUNCTION IN SOCIETY
Impact of technology on social systems with current and historical examples. Interrelations between social customs, psychological responses, physical needs, and technological developments. Decision-making process in technological change; interrelationship between technology and public policy. Prerequisite: junior and senior standing and permission of instructor. 2 two-hour lec-disc/4 cr.

697. OCEAN PROJECTS
Students work as members of interdisciplinary project teams on contemporary ocean-related problems under the guidance of a faculty adviser. Student team defines problem, prepares a budget, conducts literature surveys, engages in dialogue with experts in the ocean community, deals with vendors, designs and builds a working engineering model or conducts a comprehensive study, makes interim reports, and defends its results before a jury of experts. Prerequisite: normally senior standing and permission of the course director. A year-long course: 2 credits each semester, 4 credits total, an "IA" grade (continuous course) given at the end of the first semester. 4 cr.

Thompson School of Applied Science (TSAS)

Director: Lewis Roberts, Jr.

452. PLANT PROPAGATION AND DEVELOPMENT
Principles and practices; lab work includes types of plant propagation and handling of young plants. Prerequisite: permission of instructor. 4 cr.

453. NURSERY CULTURE AND OPERATIONS
The nursery business from seedlings to the handling of the finished product; pest control, nursery inspection, and plant quarantines. Prerequisite: permission of instructor. 3 cr.

457. GREENHOUSE MANAGEMENT
Growing plants under plastic and glass; soils, soil mixes, water, heat, and light; behavior of plants in artificial environments; pest control. Prerequisite: permission of instructor. 4 cr.

458. COMMERCIAL FLORICULTURE
Continuation of 457. The leading cut flowers, potted plants, bulbous crops, certain vegetables, and some minor crops and annuals as box plants. Prerequisite: permission of instructor. 4 cr.

Wildlife Management

(See Institute of Natural and Environmental Resources)

Zoology (84)

Chairperson: Philip J. Sawyer

PROFESSORS: Edythe T. Richardson, emerita; Arthur C. Borror, Wilbur L. Bullock, Lorus J. Milne, Philip J. Sawyer, Emery F. Swan, Paul A. Wright
ASSOCIATE PROFESSORS: Paul E. Schaefer, emeritus; Robert A. Croker, John E. Foret, Larry G. Harris, Frank K. Hoornbeek, Marcel E. Lavoie, John J. Sasner, Edward K. Tillinghast
ADJUNCT ASSOCIATE PROFESSOR: Clarence Porter
ASSISTANT PROFESSORS: Edward N. Francq, James F. Haney, Roderick M. Smith, E.H. Wheeler, Jr.
LECTURER: Abigail R. Lumsden

(412) 412. PRINCIPLES OF ZOOLOGY
Concepts of animal biology, introduction to ecological relationships, anatomy, physiology, embryology, taxonomy, and evolution. Intended principally for majors in the biological sciences. 4 cr.

507-508. HUMAN ANATOMY AND PHYSIOLOGY
All systems in human body. Laboratories: a dissection of preserved cats and experiments with living tissues. 4 cr.

(518). VERTEBRATE MORPHOLOGY
Basic morphological features of vertebrates. Structure of the major systems at macroscopic and microscopic levels. Prerequisite: Zoo. 412. 4 cr.

527 (527). VERTEBRATE PHYSIOLOGY
Principles and comparative function of vertebrate systems; cell, organ, and system levels. Prerequisite: Zoo. 412, 518 and Chemistry 403-404. 4 cr.

542. ORNITHOLOGY
Identification and biology of birds, especially those of northeastern United States. Field trips, laboratory, and lectures. Prerequisite: one semester of biology. 4 cr.

(604). PRINCIPLES OF GENETICS
Chemical and physical basis of inheritance; genes and chromosomes as units of mutation; genes in populations. Students desiring formal laboratory experience should register in Zoo. 706. Prerequisite: basic laboratory course in biological sciences. Organic chemistry and college math or statistics suggested. (Offered as Plant Science 604 alternate semester.) 3 lec/1 rec/4 cr.

618. INTRODUCTORY INVERTEBRATE ZOOLOGY
Lecture and laboratory survey of invertebrate phyla; systematics, morphology, phylogeny, and natural history. Prerequisite: Zoo. 412 or equivalent. 4 cr.

704. COMPARATIVE ENDOCRINOLOGY
Endocrine organs; relationship to control of the internal environment, growth, development, and adaptation to the external environment. Prerequisite: vertebrate anatomy and physiology; organic chemistry. 4 cr.

706. GENETICS LABORATORY
Experiments and demonstrations in classical, developmental, and population genetics and cytogenetics, using a wide range of organisms and techniques. Pre- or corequisite: Zoo. 604 or equivalent and permission of instructor. 2 cr.

(707). HUMAN GENETICS
Inheritance patterns; gene and chromosome mutation rates and effects; linkage and gene frequency. Prerequisite: Zoo. 604 or equivalent or permission of the instructor. 4 cr.

711. NATURAL HISTORY OF COLD-BLOODED VERTEBRATES
Classes of piokilothermic vertebrates; their habits, habitats, and life histories in eastern North America. Prerequisite: general zoology and Zoo. 518. 4 cr.

(712). MAMMALOGY
Origins, diversification, reproduction, ecology, behavior of mammals. Identification of local forms. Prerequisites: Zoo. 412, 518. 4 cr.

(713). ANIMAL BEHAVIOR
Individual and social behavior. The role of anatomy, physiology, ecology, and prior experience. Techniques and practical application. Prerequisite: one year of zoology. 4 cr.

715. NATURAL HISTORY OF MARINE INVERTEBRATES
Field and laboratory course; inshore marine invertebrate metazoan animals of northern New England. Identification, classification, habitat preferences, and behavior. Work (collection and observation) constitutes a major part of the course. Some travel expense. Prerequisite: general zoology. Summer only. 4 cr.

717. GENERAL LIMNOLOGY
Special relationships of freshwater organisms to the chemical, physical, and biological aspects of the aquatic environment. Factors regulating the distribution of organisms and primary and secondary productivity of lake habitats. Prerequisites: Biology 541 or equivalent. 4 cr.

719. FIELD LIMNOLOGY
Freshwater ecology examined through laboratory exercises with freshwater habitats. Methods to study freshwater lakes; interpretation of data. Seminars and occasional Saturday field trips. Prerequisite: present or prior enrollment in Botany 717, Zoo. 717, or equivalent; and permission of instructor. 3 cr.

721. PARASITOLOGY
Introduction to the more important parasites causing disease in man and animals. Living materials will be used as far as possible. Prerequisite: one year of zoology. 4 cr. (Alternate years: offered in 1976-77.)

723. CELL PHYSIOLOGY
Principles of chemistry and physics applied to understanding cell structure and function. Metabolic reactions and their control in relation to cell organization; genesis and function of specialized cells. Prerequisite: organic chemistry. 4 cr.

724. MARINE PARASITOLOGY
Diseases and parasites of marine fishes and shellfish; emphasis on the local estuarine environment. Prerequisite: one year of zoology. 4 cr. (Alternate years: offered in 1977-78.)

728. INVERTEBRATE EMBRYOLOGY
Principles of animal development including metamorphosis and regeneration in representative invertebrates. Prerequisite: Zoo. 618. 3 lec/1 lab/4 cr.

729. VERTEBRATE EMBRYOLOGY
Principles of animal development including metamorphosis, regeneration, and aging in selected vertebrates. Prerequisites: Zoo. 518, 527, and 604. 3 lec/1 lab/4 cr.

730. VERTEBRATE HISTOLOGY
Microscopic anatomy of vertebrate tissues and organs at the light microscope level; emphasis—mammalian histology; some comparative study of lower vertebrates. Prerequisite: Zoo. 508 or 518 or equivalent. 1-hr lec/6-hr lab/4 cr.

772. FISHERIES BIOLOGY
Information and techniques used by fisheries biologists. Emphasis on fish life history, ecology, and economics as related to management techniques. Prerequisite: Zoo. 711 or equivalent, and permission of instructor. 4 cr.

774. INTRODUCTION TO MARINE SCIENCE
Daily lectures; laboratory, and field work. Offered at the Isles of Shoals in cooperation with Cornell and the State University of New York. Summers only. Prerequisite: at least a full year of college biology. 5 cr.

795,796. SPECIAL PROBLEMS IN ZOOLOGY
1) Biological Oceanography; 2) Ecology; 3) Endocrinology; 4) Evolution; 5) Developmental Biology; 6) Genetics; 7) Histology; 8) History of Zoology; 9) Invertebrate Zoology; 10) Physiology; 11) Vertebrate Zoology; 12) Zoogeography; 13) Zoological Techniques; 14) Parasitology; 15) Histochemistry; 16) Protozoology; 17) Systematics; 18) Animal Behavior; 19) Teaching Practices. May elect one or more sections for advanced study. Reading, laboratory work, organized seminars, and/or conferences. Prerequisite: permission of staff required. (Limit of 12 credits from the sections of this course.) 2 or 4 cr.

Faculty and Cooperative Extension

Faculty Emeriti

Abbot, Helen D.
Associate Professor Emeritus, Library; A.B., Wheaton College, 1929; S.B. in L.S., Simmons College, 1930; A.M., Middlebury College, 1939; (1943 to 1972).

Babcock, Donald C.
Professor Emeritus of Philosophy; B.A., University of Minnesota, 1907; M.A., ibid., 1908; S.T.B., Boston University, 1912; D.H.L. (Hon.), University of New Hampshire, 1960; (1918 to 1956).

Barraclough, Kenneth E.
Professor Emeritus of Forestry, Extension Forester Emeritus; B.A., New York State College of Forestry, Syracuse University, 1921; M.F., Harvard University, 1940; (1926 to 1963).

Bartley, Irving D.
Associate Professor Emeritus of Music and University Carillonneur; B.M., Syracuse University, 1935; M.M., ibid., 1938; (1945 to 1968).

Barton, Philip S.
Director Emeritus, Thompson School of Applied Science, and Professor Emeritus of Applied Animal Science; B.S., University of New Hampshire, 1928; M.Ed., ibid., 1938; (1939 to 1969).

Bingham, Sylvester H.
Professor Emeritus of English; A.B., Dartmouth College, 1922; A.M., Harvard University, 1929; Ph.D., Yale University, 1937; (1936 to 1970).

Boynton, C. Hilton
Professor Emeritus of Dairy Science and Extension Dairyman Emeritus; B.S., Iowa State College, 1934; M.S., ibid., 1940; Ph.D., Rutgers University, 1962; (1945 to 1972).

Brackett, Thelma
University Librarian Emeritus; A.B., University of California, 1919; Certificate, California State Library School, 1920; D.H.L. (Hon.), University of New Hampshire, 1962; (1942 to 1962).

Bratton, Karl H.
Professor Emeritus of Music; B.M., University of Kansas, 1931; M.A., Teachers College, Columbia University, 1945; (1945 to 1971).

Campbell, Willis C.
Research Associate Emeritus, Engineering Experiment Station; B.S., New Hampshire College, 1906; (1938 to 1954).

Carroll, Herbert A.
Professor Emeritus of Psychology; A.B., Bates College, 1923; A.M., Brown University, 1928; Ph.D., Columbia University, 1930; (1941 to 1962).

Chapman, Donald H.
Professor Emeritus of Geology; B.A., University of Michigan, 1927; M.A., ibid., 1928; Ph.D., ibid., 1931; (1931 to 1974).

Clark, William E.
Assistant Professor Emeritus of Mechanical Engineering; B.S., University of New Hampshire, 1931; (1946 to 1974).

Colby, Halstead N.
Associate Professor Emeritus of Soil and Water Science, Extension Agricultural Engineer Emeritus; B.S., University of New Hampshire, 1930; (1932 to 1936, 1946 to 1968).

Colovos, Nicholas F.
Professor Emeritus of Animal Science; B.S., University of New Hampshire, 1927; M.S., ibid., 1931; (1928 to 1971).

Conklin, James G.
Professor Emeritus of Entomology; B.S., Connecticut Agricultural College, 1926; M.S., University of New Hampshire, 1929; Ph.D., Ohio State University, 1941; (1931 to 1971).

Danoff, Alexander P.
Assistant Professor Emeritus of German; A.B., New York University, 1928; A.M., ibid., 1929; (1948 to 1969).

Degler, Carroll M.
Professor Emeritus of Business Administration and Economics; A.B., University of Kansas, 1925; M.B.A., New York University, 1927; S.S. Columbia University, 1933; (1928 to 1973).

Deichert, Lillian C.
Associate Professor Emeritus Loan Librarian; A.B., Hunter College, 1933; M.L.S., Pratt Institute, 1960; (1964 to 1975).

DeQuoy, Ruth W.
Associate State 4-H Leader Emeritus; B.A., New Hampshire College, 1921; M.Ed., University of Maryland, 1953; (1929 to 1965).

Duncan, Lillian R.
Associate Professor Emeritus Public Service Librarian; B.A., University of Oklahoma, 1933; (1934 to 1973).

Dunn, Stuart
Professor Emeritus of Botany; B.S., University of Minnesota, 1923; M.S., Iowa State College, 1925; Ph.D., University of Minnesota, 1931; (1926 to 1970).

Eggert, Russell
Professor Emeritus of Horticulture; B.S., Michigan State College, 1929; M.S., ibid., 1939; (1942 to 1946, 1948 to 1970).

Ellis, Elizabeth E.
Extension Associate Professor Emeritus of Home Economics; B.S., Teachers College, Columbia University, 1927; M.A., ibid., 1929; (1929 to 1960).

Fernald, Mary Louise
Associate Professor Emeritus of Nursing; B.S., University of New Hampshire, 1931; M.S., Columbia College, 1964; (1964 to 1974).

Hall, Harry H.
Professor Emeritus of Physics and Project Director; B.S., Union College, 1926; Ph.D., Harvard University, 1934; (1940 to 1969).

Haslerud, George M.
Professor Emeritus of Psychology; B.A., University of Minnesota, 1930; Ph.D., ibid., 1934; (1945 to 1972).

Hitchcock, Leon W.
Professor Emeritus of Electrical Engineering; B.S., Worcester Polytechnic Institute, 1908; (1910 to 1956).

Hodgdon, Albion R.
Professor Emeritus of Botany; B.S., University of New Hampshire, 1930; M.S., ibid., 1932; Ph.D., Harvard University, 1936; (1930 to 1975).

Hogan, John A.
Professor Emeritus of Economics; A.B., Washington University, 1932; A.M., ibid., 1934; M.A., Harvard University, 1948; Ph.D., ibid., 1952; (1947 to 1974).

Hoitt, Samuel W.
Director Emeritus of the Cooperative Extension Service and Professor Emeritus of Agricultural Education; B.S., University of New Hampshire, 1926; Ph.D., Columbia University, 1931; (1938).

Holden, John T.
Professor Emeritus of Political Science; A.B., Wesleyan University, 1936; M.P.A., Harvard University, 1941; M.A., ibid., 1942; Ph.D., ibid., 1943; LL.D. (Hon.), Nasson College, 1958; (1947 to 1972).

Huddleston, Eric T.
Professor Emeritus of Architecture; B.Arch., Cornell University, 1910. (1919 to 1957).

Iddles, Harold A.
Professor Emeritus of Chemistry; B.S., Michigan State University, 1918; M.S., University of Iowa, 1921; Ph.D., Columbia University, 1925; D.Sc. (Hon.), University of New Hampshire, 1966; (1929 to 1965).

James, Jesse
State Leader Emeritus, Extension 4-H Youth Development and Associate Professor Emeritus of Occupational Education; B.S., University of Georgia, 1937; M.S., ibid., 1951; (1957 to 1974).

Johnson, G. Reid
Associate Professor Emeritus of History; A.B., Muskingum College, 1916; M.A., Princeton University, 1920; Ph.D., University of Edinburgh, 1922; (1932 to 1963).

Kichline, William Levi
Professor Emeritus of Mathematics; B.A., Lehigh University, 1924; M.S., ibid., 1928; (1931 to 1974).

Langer, Clarence A.
Professor Emeritus of Plant Science and Extension Horticulturist Emeritus, Fruits; B.S., Michigan State University, 1933; M.S., ibid., 1948; Ph.D., ibid., 1952; (1962 to 1974).

Lavine, Irvin
Professor Emeritus of Chemical Engineering; B.S., University of Minnesota, 1924; Ph.D., ibid., 1930; (1948 to 1949, 1951 to 1965).

Marschner, Donald C.
Professor Emeritus of Business Administration; B.A., Brown University, 1929; Ph.D., Columbia University, 1964; (1964 to 1975).

Marshall, Thomas O.
Professor Emeritus of Education; A.B., Colgate University, 1929; Ed.M., S.U.N.Y. at Buffalo, 1933; Ed.D., Harvard University, 1941; (1947 to 1973).

Maynard, Max S.
Professor Emeritus of English; B.A., University of British Columbia, 1937; (1946 to 1972).

Meyers, T. Ralph
Professor Emeritus of Geology; B.A., Ohio State University, 1926; M.A., ibid., 1929; (1927 to 1972).

Mills, Marian E.
Assistant Professor Emeritus of Botany; B.S., Teachers College, Columbia University, 1917; M.A., ibid., 1920; (1927 to 1957).

Morrow, Kenneth S.
Professor Emeritus of Dairy Science; B.S., University of Minnesota, 1918; M.S., ibid., 1925; (1934 to 1966).

Nast, Charlotte G.
Professor Emeritus of Botany; B.A., University of Wisconsin, 1927; M.A., ibid., 1929; Ph.D., University of California, 1938; (1948 to 1970).

Partridge, Allan B.
Associate Professor Emeritus of History; A.B., Clark University, 1922; A.M., ibid., 1923; (1925 to 1971).

Perry, Errol C.
Thompson School Assistant Professor Emeritus of Farm Management; B.S., University of Massachusetts, 1920; (1929 to 1942, 1946 to 1962).

Pew, Richard
Associate Professor Emeritus of Hotel Administration; B.S., Cornell University, 1933; (1963 to 1974).

Phillips, Thomas G.
Professor Emeritus of Agricultural and Biological Chemistry; B.S., Ohio State University, 1912; M.S., ibid., 1913; Ph.D., University of Chicago, 1918; (1925 to 1957).

Prince, Ford S.
Professor Emeritus of Agronomy; B.S., University of Illinois, 1913; (1925 to 1957).

Rand, M. Elizabeth
Associate Professor Emeritus of Home Economics; A.B., Wheaton College, 1930; M.Ed., Boston University, 1946; (1948 to 1973).

Richardson, Edythe T.
Professor Emeritus of Zoology; B.S., New Hampshire College, 1922; M.S., University of New Hampshire, 1924; (1922 to 1966).

Ringrose, Richard C.
Professor Emeritus of Animal Science; B.S., Cornell University, 1932; Ph.D., ibid., 1936; (1942 to 1975).

Sackett, Everett B.
Dean Emeritus of the College of Liberal Arts and Professor Emeritus of Education; B.A., Hamline University, 1923; M.A., University of Minnesota, 1926; Ph.D., Columbia University, 1931; (1938 to 1967).

Schaefer, Paul E.
Associate Professor Emeritus of Zoology; A.B., Bethany College, 1926; M.S., Ohio State University, 1931; Ph.D., ibid., 1936; (1941 to 1971).

Seiberlich, Joseph
Research Professor Emeritus, Engineering Experiment Station; Diploma Ingenieur, Technical University, Karlsruhe, Germany, 1924; Doctor Ingenieur, ibid., 1928; (1941 to 1962).

Shimer, Stanley R.
Professor Emeritus of Biochemistry; B.S., Muhlenberg College, 1918; M.S., Pennsylvania State College, 1923; (1924 to 1966).

Skelton, Russell R.
Professor Emeritus of Civil Engineering; B.S., Purdue University, 1924; C.E., ibid., 1934; S.M., Harvard University, 1939; (1928 to 1966).

Stevens, Henry B.
Director Emeritus of University Extension Service; A.B., Dartmouth College, 1912; (1918 to 1956).

Stolworthy, E. Howard
Professor Emeritus of Mechanical Engineering; B.S. Tufts College; 1922; Ph.D. (Hon.), University of New Hampshire, 1974; (1922 to 1968).

Swasey, Henry C.
Associate Professor Emeritus of Intercollegiate Athletics; B.S., Amherst College, 1915; M.S., Indiana University, 1941; (1921 to 1962).

Sweet, Paul C.
Coach of Track and Cross Country and Professor Emeritus of Physical Education; B.S., University of Illinois, 1923; M.S., University of Southern California, 1941; (1924 to 1970).

Thames, Sarah
Associate Professor Emeritus of Home Economics; B.S., Simmons College, 1930; M.S., Teachers College, Columbia University, 1942; (1945 to 1961).

Tyrrell, Doris E.
Associate Professor Emeritus of Secretarial Studies; B.S., University of Minnesota, 1926; M.A., ibid., 1932; (1938 to 1966).

Walsh, John S.
Professor Emeritus of Languages; A.B., Harvard University, 1915; A.M., Boston University, 1928; D.H.L. (Hon.), University of New Hampshire, 1965; (1922 to 1962).

Warren, Richard
Professor Emeritus of Poultry Science, Extension Poultryman Emeritus; B.S., Cornell University, 1934; M.S., ibid., 1935; (1937 to 1970).

Watson, Robert
Professor Emeritus of Psychology; A.B., Dana College, 1933; A.M., Columbia University, 1935; Ph.D., ibid., 1938; (1967 to 1975).

Webster, Robert G.
Professor Emeritus of English; B.A., University of New Hampshire, 1926; M.A., ibid., 1930; (1927 to 1970).

Woodruff, Ruth J.
Professor Emeritus of Economics; B.A., Bryn Mawr, 1919; A.M., ibid., 1920; Ph.D., Radcliffe College, 1931; (1931 to 1967).

Wooster, Caroline S.
Associate Professor Emeritus of Physical Education; Cert., Sargent School for Physical Education, 1926; B.S., University of New Hampshire, 1934; (1944 to 1970).

Zimmerman, Oswald T.
Professor Emeritus of Chemical Engineering; B.S.E., University of Michigan, 1929; M.S.E., ibid., 1931; Ph.D., ibid., 1934; (1938 to 1970).

Faculty

Abeles, Sigmund M.
Associate Professor of The Arts; A.B., University of South Carolina, 1955; M.F.A., Columbia University, 1957; appointed 1970.

Abromson, Morton C.
Instructor in The Arts; A.B., Boston University, 1963; M.A., ibid., 1964; appointed 1972.

Ackerman, Margaret D.
Assistant Professor of Education; B.S., University of Arizona, 1961; M.A., ibid., 1967; Ph.D., University of Pennsylvania, 1971; appointed 1971.

Adamovich, Frank W.
Assistant Professor, Documents Librarian; B.S., Fitchburg State Teachers College, 1960; M.S., Simmons College, 1968; appointed 1968.

Adams, Robert L.A.
Assistant Professor of Geography; B.A., Williams College, 1961; M.A., Clark University, 1966; Ph.D., ibid., 1971; appointed 1967.

Adams, W. Thomas
Assistant Professor of Forest Resources; B.S., Humboldt State College, 1968; M.S., North Carolina State University, 1970; Ph.D., University of California, 1974; appointed 1974.

†**Allen, Fred E.**
Professor of Animal Science and Veterinarian; B.S., University of New Hampshire, 1932; D.V.M., Ohio State University, 1936; appointed 1940.

Allmendinger, E. Eugene
Associate Professor of Naval Architecture and Executive Officer OMSAT; B.S., University of Michigan, 1941; M.S., University of New Hampshire, 1950; appointed 1958.

Alonzo, Roy S.
Thompson School Associate Professor of Food Services Management; A.S., Becker Junior College, 1951; B.S., Boston University, 1953; M.B.A., Western New England College, 1961; appointed 1969.

Amell, Alexander R.
Professor of Chemistry; B.S., University of Massachusetts, 1947; Ph.D., University of Wisconsin, 1950; appointed 1955.

Amsden, Katherine
Associate Professor of Physical Education; A.B., Sweet Briar College, 1953; M.S., Smith College, 1956; Ph.D., University of Southern California, 1967; appointed 1967.

Andersen, Kenneth K.
Professor of Chemistry; B.S., Rutgers University, 1955; Ph.D., University of Minnesota, 1959; appointed 1960.

Anderson, Charlotte K.
Professor, Assistant Librarian; B.A., University of Michigan, 1935; A.B.L.S., ibid., 1936; A.M.L.S., ibid., 1951; appointed 1943.

Anderson, Franz E.
Associate Professor of Geology; B.A., Ohio Wesleyan University, 1960; M.A., Northwestern University, 1962; Ph.D., University of Washington, 1967; appointed 1967.

Andrew, Michael D.
Associate Professor of Education and Coordinator for Teacher Education; B.S., Cornell University, 1960; A.M.T., Harvard University, 1961; Ed.D., ibid., 1969; appointed 1966.

†**Andrews, Richard A.**
Professor of Resource Economics; B.S., University of Maine, 1949; M.S., Pennsylvania State University, 1951; Ph.D., University of Minnesota, 1959; appointed 1959.

Annis, William H.
Professor of Occupational Education; B.S., University of Maine, 1951; M.Agri.Ed., University of New Hampshire, 1959; Ed.D., Cornell University 1961; appointed 1962.

Antonak, Richard F.
Assistant Professor of Education; B.A., Rutgers University, 1969; M.Ed., Temple University, 1970; Ed.D., ibid., 1975; Appointed 1974.

Antosiewicz, Rose T.
Assistant Professor of Italian; A.B., Brown University, 1954; Ph.D., University of California at Los Angeles, 1971; appointed 1970.

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* Indicates time devoted to Cooperative Extension Service
† Indicates time devoted to Agricultural Experiment Station

Arnoldy, Roger L.
Professor of Physics and Director of Space Science Center; B.S., St. Mary's College, 1956; M.S., University of Minnesota, 1959; Ph.D., ibid., 1962; appointed 1967.

Ashley, Charles H.
Associate Professor of Education; A.B., Dartmouth College, 1957; M.Ed., University of New Hampshire, 1960; Ed.D., Boston University, 1969; appointed 1969.

Aultman, Dwight E., III
Trainer, Physical Therapist; Assistant Professor of Physical Education; B.S., Medical College of Virginia, 1956; appointed 1966.

Azzi, Victor D.
Adjunct Professor of Mechanics; B.S., University of New Hampshire, 1955; D.Eng., Yale University, 1961; appointed 1965.

Baker, Alan L.
Assistant Professor of Botany; B.A., Harpur College, S.U.N.Y., 1965; Ph.D., University of Minnesota, 1973; appointed 1972.

Balderacchi, Arthur E.
Associate Professor of The Arts; A.B., Duke University, 1960; M.F.A., University of Georgia, 1965; appointed 1965.

Balling, L.C.
Professor of Physics; B.A., Oberlin College, 1960; M.A., Harvard University, 1961; Ph.D., ibid., 1965; appointed 1967.

Balomenos, Richard H.
Professor of Mathematics Education; B.S., United States Merchant Marine Academy, 1952; M.A., New York University, 1956; M.S., University of Notre Dame, 1961; Ph.D., Harvard University, 1961; appointed 1961.

Barker, Joyce
Assistant Professor of Nursing; Dipl., Eastern Maine General Hospital, Portland, 1958; B.S.N., St. Anselms College 1972; M.S., Boston College, 1975; Appointed 1975.

Barlow, Robert F.
Professor of Economics and Administration; B.A., Colby College, 1950; M.A.A., Fletcher School of Law and Diplomacy, Tufts University, 1951; Ph.D., ibid., 1960; appointed 1962.

***Barney, Dwight E.**
Assistant Extension Livestock Specialist, Lecturer in Animal Science, and Farm Coordinator; B.S., University of New Hampshire, 1967; M.S., ibid., 1972; appointed 1971.

***Barrett, James P.**
Professor of Forest Biometrics; B.S., North Carolina State University, 1954; M.F., Duke University, 1958; Ph.D., ibid., 1962; appointed 1962.

Barstow, Thomas R.
Assistant Professor of Physical Education; B.S., St. Lawrence University, 1961; M.Ed., ibid., 1965; appointed 1965.

Batchelder, Gerald M.
Thompson School Associate Professor of Civil Technology and Adjunct Associate Professor of Civil Engineering; B.S.C.E., University of New Hampshire, 1950; M.S.C.E., Purdue University, 1952; appointed 1953.

Batcheller, Joseph D.
Professor of Speech and Drama; A.B., Carnegie Institute of Technology, 1936; A.M., University of Minnesota, 1938; Ph.D., ibid., 1942; appointed 1944.

Batho, Edward H.
Professor of Mathematics; B.S., Fordham University, 1950; M.S., University of Wisconsin, 1952; Ph.D., ibid 1955; appointed 1960.

Beasley, Wayne M.
Associate Professor of Materials Science; S.B., Harvard College, 1946; S.M., Massachusetts Institute of Technology, 1965; appointed 1957.

Bechtell, Homer F., Jr.
Associate Professor of Mathematics; B.S., Grove City College, 1951; M.A., University of Wisconsin, 1956; Ph.D., ibid., 1963; appointed 1966.

Beckett, John A.
Forbes Professor of Management; B.S., University of Oregon, 1939; M.B.A., Harvard University, 1946; C.P.A.; appointed 1962.

Beckwith, Marion C.
Professor of Physical Education; A.B., Oberlin College, 1935; M.Ed., University of New Hampshire, 1937; appointed 1935.

Bell, R. Virginia
Associate Professor of Occupational Therapy; B.S., University of Michigan, 1953; Certificate O.T.R., Boston School of Occupational Therapy, 1955; appointed 1958.

Bennett, Albert B.
Associate Professor of Mathematics; B.S., Maine Maritime Academy, 1954; B.S., University of Maine, 1958; M.A., ibid., 1959; Ed.D., University of Michigan, 1966; appointed 1967.

Bereit, Virginia F.
Assistant Professor of Education; B.S., Baldwin Wallace College, 1953; M.E., Kent State University, 1958; Ed.D., Columbia University, 1971; appointed 1973.

Bergeron, R. Daniel
Assistant Professor of Mathematics; Sc.B., Brown University, 1966; Ph.D., ibid., 1973; appointed 1974.

Bernard, Roger P.
Dean of Academic Affairs, Merrimack Valley Branch; B.S., Fordham College, 1960; M.A., Fordham University, 1963; appointed 1973.

Bernier, Raymond J.
Assistant Professor and Technical Director of Speech and Drama; B.S., Bradford Durfee College, 1958; M.Ed., Bridgewater State College, 1960; M.A., Smith College, 1967; appointed 1967.

Berry, David E.
Associate Professor of Health Studies; B.S., University of Kentucky, 1962; M.S., University of North Carolina, 1963; Ph.D., ibid., 1971; Appointed 1975.

Bertsch, Gregory J.
Assistant Professor of Psychology; B.A., Boston College, 1966; M.A., University of Vermont, 1968; Ph.D., ibid., 1970; appointed 1970.

Bigglestone, Gail A.
Assistant Professor of Physical Education; B.S., University of New Hampshire, 1960; M.S., University of Massachusetts, 1965; appointed 1970.

Birch, Francis S.
Assistant Professor of Earth Sciences; A.B., Harvard University, 1958; M.S., University of Wisconsin, 1964; Ph.D., Princeton University, 1969; appointed 1972.

Bishop, Paul L.
Associate Professor of Civil Engineering; B.S.C.E., Northeastern University, 1968; M.S.C.E., Purdue University, 1970; Ph.D., ibid., 1972; appointed 1972.

Blanchard, Fletcher A., Jr.
Professor of Electrical Engineering and Associate Director EDAL; B.S., Union College, 1948; M.S., Lehigh University, 1950; appointed 1950.

†**Blanchard, Robert O.**
Assistant Professor of Plant Pathology; B.S., University of Maine (Gorham), 1964; M.Ed., University of Georgia, 1969; Ph.D., ibid., 1971; appointed 1972.

†**Blickle, Robert L.**
Professor of Entomology; B.S., Ohio State University, 1937; M.S., University of New Hampshire, 1939; Ph.D., Ohio State University, 1942; appointed 1938-1941, 1946.

Bobick, Melvin T.
Professor of Sociology; A.B., University of Illinois, 1949; A.M., ibid., 1952; Ph.D., ibid., 1958; appointed 1958.

†**Bogle, Alfred Linn**
Associate Professor of Botany; B.S., University of Washington, 1958; M.S., ibid., 1961; Ph.D., University of Minnesota, 1968; appointed 1970.

Bolian, Charles
Assistant Professor of Anthropology; B.A., Mississippi State University, 1965; Ph.D., University of Illinois, 1975; appointed 1971.

Bonnice, William E.
Associate Professor of Mathematics; B.A.E., Syracuse University, 1951; M.S., University of Washington, 1960; Ph.D., ibid., 1962; appointed 1962.

Borror, Arthur C.
Professor of Zoology; B.S., Ohio State University, 1956; M.S., ibid., 1958; Ph.D., Florida State University, 1961; appointed 1961.

Bothner, Wallace A.
Associate Professor of Geology; B.A., S.U.N.Y. at Binghamton, 1963; Ph.D., University of Wyoming, 1967; appointed 1967.

Bowers, Dolores J.
Assistant Professor of Nursing; Diploma, Reading Hospital School of Nursing, 1954; B.S., Teachers College, Columbia University, 1964; Ed.M., ibid., 1970; appointed 1972.

Bowers, M. William
Head Football Coach and Lecturer in Physical Education; B.S., Pennsylvania State University, 1965; appointed 1966-67, 1972.

***Bowman, James S.**
Assistant Professor Entomology and Extension Entomologist; B.Sc., Ohio State University, 1951; M.Sc., ibid., 1954; Ph.D., University of Wisconsin, 1958; appointed 1971.

†**Bowring, James R.**
Professor of Resource Economics; B.S.A., University of Manitoba, 1936; M.A., University of Alberta, 1940; Ph.D., Iowa State University, 1944; appointed 1948.

Boy, Angelo V.
Professor of Education; A.B., University of Notre Dame, 1953; Ed.M., Boston University, 1955; Ed.D., ibid., 1960; appointed 1965.

Boynton, Jason E.
Associate Professor of Education; and Director, Center for Educational Field services; B.Ed., Plymouth Teachers College, 1949; M.Ed., University of New Hampshire, 1952; appointed 1966.

Bozak, John C., Jr.
Thompson School Associate Professor of Forest Technology; B.S., University of Connecitcut, 1962; M.F., Yale School of Forestry, 1963; appointed 1967.

Bradley, David B. (Major)
Lecturer in Military Science; B.A., University of New Hampshire, 1962; M.S., ibid., 1975; appointed 1975.

Braff, Allan J.
Associate Professor of Economics and Business Administration; A.B., University of Rochester, 1951; M.B.A., Columbia University, 1953; Ph.D., University of Wisconsin, 1959; appointed 1965.

Breeding, Charles H.J.
Thompson School Professor of Applied Soil Sciences; B.S., University of New Hampshire, 1949; M.S., ibid., 1966; appointed 1963.

Briden, Earl F.
Assistant Professor of English; Ed.B., Rhode Island College, 1963; M.A., Brown University, 1966; Ph.D., ibid., 1970; appointed 1970.

Briggs, Janet C.
Lecturer in Animal Science; B.S., University of Massachusetts, 1962; appointed 1963.

Brockelman, Paul T.
Associate Professor of Philosophy; A.B., Dartmouth College, 1957; M.A., Northwestern University, 1963; Ph.D., ibid., 1968; appointed 1963.

Broderick, Dale G.
Associate Professor of Business Administration; B.S. University of Michigan, 1957; M.B.A., University of Chicago, 1961; Ph.D., Columbia University, 1973; appointed 1974.

Brown, Jean Morrison
Assistant Professor of Speech and Drama; B.A., University of Kentucky, 1956; M.A., Mills College, 1962; appointed 1965.

Brown, Roger S.
Assistant Professor of German; A.B., Emory University, 1966; M.A., University of Kansas, 1969; Ph.D., ibid., 1971; appointed 1974.

Brown, Warren R.
Instructor in Political Science; B.A., Willamette University, 1966; M.A., Claremont Graduate School, 1972; appointed 1972.

Brown, Wendell S.
Assistant Professor of Earth Science; B.S., Brown University, 1965; M.S., ibid., 1967; Ph.D., Massachusetts Institute of Technology, 1971; appointed 1974.

Browne, Evelyn
Professor of Physical Education; A.B., University of California, 1942; M.A., Teachers College, Columbia University, 1943; M.A., University of New Hampshire, 1960; appointed 1942.

†**Bruns, Paul E.**
Professor of Forest Resources; A.B., New York University, 1937; M.F., Yale University, 1940; Ph.D., University of Washington, 1956; appointed 1958.

Buckley, Walter F.
Professor of Sociology; B.A., Brown University, 1952; Ph.D., University of Wisconsin, 1958; appointed 1971.

Bullock, Wilbur L.
Professor of Zoology; B.S., Queens College, 1942; M.S., University of Illinois, 1947; Ph.D., ibid., 1948; appointed 1948.

Burns, Carol L.
Associate Professor in Speech and Drama; B.S., Syracuse University, 1963; Diploma, American Musical and Drama Academy, 1965; M.F.A., University of Utah, 1969; appointed 1969.

Burns, Thomas R.
Associate Professor of Sociology; B.S., Stanford University, 1959; M.A., ibid., 1963; Ph.D., ibid., 1969; appointed 1968.

Burt, John, Jr.
Assistant Professor of Administration; B.A., Wesleyan University, 1965; M.S., Carnegie-Mellon University, 1967; Ph.D., ibid., 1969; appointed 1974.

Burton, David M.
Associate Professor of Mathematics; B.A., Clark University, 1954; A.M., University of Rochester, 1956; Ph.D., ibid., 1961; appointed 1959.

†Byers, Gordon L.
Professor of Soil and Water Science; B.S., MacDonald College, 1948; M.S.A., Ontario Agricultural College, 1950; appointed 1956.

Byrnes, Michael T. (Captain, U.S. Army)
Lecturer in Military Science; B.A., Providence College, 1967; M.A., University of New Hampshire, 1974; appointed 1973.

Calabria, Kenneth F.
Lecturer in Aerospace Studies; B.A., Boston College, 1964; M.S., University of Southern California, 1972; appointed 1975.

Caldwell, S. Anthony
Associate Professor of English and Humanities; A.B., Columbia College, 1952; M.A., Columbia University, 1953; Ph.D., Harvard University, 1968; appointed 1957.

Callan, Richard J.
Associate Professor Spanish; A.B., Iona College, 1957; M.A., Fordham University, 1959; Ph.D., St. Louis University, 1965; appointed 1969.

Cannon, Michael R.
Assistant Professor of Electrical Engineering; B.S.E.E., Pennsylvania State University, 1966; M.S., Rensselaer Polytechnic Institute, 1968; Ph.D., ibid., 1970; appointed 1974.

Canon, Lance K.
Associate Professor of Psychology; B.A., Yale University, 1961; M.A., Stanford University, 1963; Ph.D., ibid., 1965; appointed 1973.

Carbonneau, Lionel J.
Coach of Lacrosse and Assistant Professor of Physical Education; B.A., University of New Hampshire, 1952; appointed 1965.

Carney, John J.
Assistant Professor of Education; B.A., Seton Hall University, 1963; M.A., ibid., 1967; Ph.D., Syracuse University, 1973; appointed 1973.

Carnicelli, Thomas A.
Associate Professor of English; A.B., Princeton University, 1958; M.A., Harvard University, 1960; Ph.D., ibid., 1966; appointed 1967.

Carroll, John E.
Assistant Professor of Environmental Conservation; A.B., Louisiana Technical University, 1966; M.A., Western Michigan University, 1968; Ph.D., Michigan State University, 1974; appointed 1974.

Carter, Gavin H.
Associate Professor of Physical Education; B.S., Springfield College, 1952; M.S. ibid., 1953; Ph.D., University of Oregon, 1958; appointed 1965.

Casás, R. Alberto
Professor of Spanish; B.En.L., Columbia University, 1936; A.M., Columbia University, 1947; Ph.D., ibid., 1954; appointed 1952.

Celikkol, Barbaros
Assistant Professor of Mechanical Engineering; B.A., Elon College, 1964; M.S., Stevens Institute of Technology, 1967; Ph.D., University of New Hampshire, 1972; appointed 1969.

Chaltas, John G.
Associate Professor of Education; B.S., Southern Connecticut State University, 1951; M.A., Columbia University, 1953; Ed.D., ibid., 1957; appointed 1967.

Chasteen, N. Dennis
Associate Professor of Chemistry; A.S., Flint Junior College, 1962; A.B., University of Michigan, 1965; M.S., University of Illinois, 1966; Ph.D., ibid., 1969; appointed 1972.

Chen, Jiann-Jer
Thompson School Assistant Professor of Applied Science; B.S., Taiwan Normal University, 1962; M.S., University of New Hampshire, 1968; Ph.D., ibid., 1973; appointed 1972.

Chesbro, William R.
Professor of Microbiology; B.S., Illinois Institute of Technology, 1951; M.S., ibid., 1955; Ph.D., ibid., 1959; appointed 1959.

Chupp, Edward L.
Professor of Physics; A.B., University of California, 1950; Ph.D., ibid., 1954; appointed 1962.

Cimbolic, Peter
Director of Counseling and Health Services and Adjunct Associate Professor of Education; A.B., Montclair State College, 1965; M.A., Columbia University, 1967; Ph.D., University of Missouri, 1970; appointed 1970.

Civitico, Bruno
Assistant Professor of The Arts; B.F.A., Pratt Institute, 1966; M.F.A., Indiana University, 1968; appointed 1973.

Clark, Charles E.
Professor of History; A.B., Bates College, 1951; M.S., Columbia University, 1952; Ph.D., Brown University, 1966; appointed 1967.

Clark, Margot
Assistant Professor of The Arts; B.S., Washington University, 1961; A.M., ibid., 1973; Ph.D., ibid., 1974; appointed 1974.

Clark, Ronald R.
Professor of Electrical Engineering; B.S., University of New Hampshire, 1956; M.E., Yale University, 1957; Ph.D., Syracuse University, 1963; appointed 1957.

Clee, Jan E.
Dean of the Whittemore School of Business and Economics and Professor of Organizational Development; B.A., Social Academy, 1953; M.S., Case Institute, 1963; Ph.D., ibid., 1967; appointed 1967.

Coates, Carla
Adjunct Lecturer in Medical Technology, Mary Hitchcock Hospital; B.S., University of New Hampshire, 1969; appointed 1974.

Cobb, Loren
Assistant Professor of Sociology; B.A., Cornell University, 1970; M.A., ibid., 1971; Ph.D., ibid., 1973; appointed 1972.

Cohen, Allan R.
Associate Professor of Business Administration; A.B., Amherst College, 1959; M.B.A., Harvard Graduate School of Business Administration, 1961; D.B.A., ibid., 1967; appointed 1966.

Cole, Gordon B.
Lecturer in Music; B.M., University of New Hampshire, 1975; appointed 1973.

Cole, Lawrence P.
Assistant Professor of Economics; B.Ed., Keene Teachers College, 1959; M.S., Purdue University, 1964; Ph.D., ibid., 1969; appointed 1966.

Collins, Susan R.
Instructor of Nursing; B.S., University of New Hampshire, 1971; M.S., University of Colorado, 1975; appointed 1975.

†Collins, Walter M.
Professor of Animal Science; B.S., University of Connecticut, 1940; M.S., ibid., 1949; Ph.D., Iowa State University, 1960; appointed 1951.

Congdon, Robert G.
Associate Director of Counseling and Adjunct Associate Professor of Psychology; A.B., University of California, 1947; Ed.D., Harvard University, 1961; appointed 1952.

Conner, Theodore W.
Coach of Baseball and Assistant Professor of Physical Education; B.S., Springfield College, 1955; M.S., University of Illinois, 1958; appointed 1962.

Copeland, Arthur H., Jr.
Professor of Mathematics; B.S., University of Michigan, 1949; M.A., ibid., 1950; Ph.D., Massachusetts Institute of Technology, 1954; appointed 1968.

Copeland, John A.
Head Track Coach, Lecturer in Physical Education; B.A., University of Connecticut, 1968; Teaching Certificate, ibid., 1972; appointed 1973.

Coppola, Joseph P.
Assistant Football Coach and Lecturer in Physical Education; B.S., Boston College, 1971; appointed 1972.

†Corbett, Alan C.
Associate Professor of Animal Science and Veterinarian; B.S., University of Maine, 1936; M.S., ibid., 1937; D.V.M., Michigan State College, 1940; appointed 1941.

Corcoran, Ellen P.
Assistant Professor of Education; B.A., Bryn Mawr College, 1962; M.A.T., New York University, 1968; Ph.D., ibid., 1972; appointed 1972.

Corell, Robert W.
Professor of Mechanical Engineering and Director of Marine Program; B.S.M.E., Case Institute of Technology, 1956; M.S.M.E., Massachusetts Institute of Technology, 1959; Ph.D., Case Institute of Technology, 1964; appointed 1957-60, 1964.

Craig, Robert E.
Assistant Professor of Political Science; B.A., Adelphi University, 1960; Ph.D., University of North Carolina, 1971; appointed 1966.

Crepeau, Elizabeth L.
Instructor in Occupational Therapy (Pre-clinical); B.S., University of New Hampshire, 1966; appointed 1974.

Croker, Robert A.
Associate Professor of Zoology; A.B., Adelphi College, 1958; M.S., University of Miami, 1960; Ph.D., Emory University, 1966; appointed 1966.

Crow, Garrett
Assistant Professor of Botany; A.B., Taylor University, 1965; M.S., Michigan State University, 1968; Ph.D., ibid., 1974; appointed 1975.

Crowson, Lydia L.
Assistant Professor of French; B.A., Birmingham-Southern College, 1968; M.A., University of Wisconsin, 1969; Ph.D., ibid., 1972; appointed 1972.

Daggett, Albert F.
Professor of Chemistry; B.S., University of New Hampshire, 1928; M.S., ibid., 1930; Ph.D., Columbia University, 1934; appointed 1928-31, 1935.

Datilio, Louis J.
Gymnastics Coach and Lecturer in Physical Education; B.S., Temple University, 1961; M.A., Trenton State College, 1967; appointed 1967.

Dauphinais, Edward J.
Associate Professor, Technology Branch Librarian; B.A., University of Hartford, 1956; M.S.L.S., Simmons College, 1960; appointed 1968.

Davenport, Gilbert B.
Assistant Professor of Speech and Drama; B.A., Case Western Reserve University, 1956; Certification, Naval Intelligence School, 1958; M.A., University of Denver, 1961; appointed 1962.

†Davis, Henry A.
Associate Professor of Analytical Services; B.S., University of New Hampshire, 1932; M.S., ibid., 1934; appointed 1932.

Davis, James R.
Assistant Professor of Psychology; B.A., Northern Illinois University, 1965; M.A., ibid., 1966; Ph.D., University of Wisconsin, 1969; appointed 1970.

Davis, Myra L.
Associate Professor of Secretarial Studies; B.S., Central Missouri State Teachers College, 1939; M.A., State University of Iowa, 1945; appointed 1945.

Davis, Richard S.
Dean of the College of Engineering and Physical Sciences and Professor of Materials Science; Ba.Sc., University of Toronto, 1951; Ma.Sc., ibid., 1952; Ph.D., ibid., 1954; appointed 1968.

Dawson, Carl
Associate Professor of English; A.B., Occidental College Los Angeles, 1959; M.A., Columbia University, 1960; Ph.D., ibid., 1966; appointed 1970.

Dawson, Charles O.
Professor of Civil Engineering; B.C.E., Ohio State University, 1930; M.S.C.E., ibid., 1940; appointed 1930.

Dawson, John F.
Associate Professor of Physics; B.S., Antioch College, 1958; Ph.D., Stanford University, 1962; appointed 1968.

Dawson, Judith A.
Instructor of Home Economics; B.S., Arizona State University, 1968; M.S., Pennsylvania State University, 1970; appointed 1971.

Dean, Patricia
Assistant Professor of Nursing; B.S., Boston University, 1967; M.S., ibid., 1970; C.A.G.S., Northeastern University, 1974; appointed 1974.

DePorte, Michael V.
Associate Professor of English; B.A., University of Minnesota, 1960; M.A., Stanford University, 1964; Ph.D., ibid., 1966; appointed 1972.

Desrosiers, Patricia
Lecturer in Speech and Drama; B.S., Southern Illinois University, 1971; M.S., ibid., 1972; appointed 1973.

Desrosiers, Richard V.
Assistant Professor of Classics; A.B., Boston College, 1960; A.M., University of Wisconsin, 1961; Ph.D., University of North Carolina, 1969; appointed 1965.

DeVille, Phillipe
Assistant Professor of Economics; B.A., University of Louvain (Belgium), 1967; M.A., ibid., 1967; Ph.D., Stanford University, 1973; appointed 1973.

DeVoto, Mark B.
Associate Professor of Music; A.B., Harvard College, 1961; M.F.A., Princeton University, 1963; Ph.D., ibid., 1967; appointed 1968.

Dewey, Richard S.
Professor of Sociology; A.A., Pasadena Junior College, 1934; A.B., College of Wooster, 1936; M.A., Oberlin College, 1939; Ph.D., University of Wisconsin, 1946; appointed 1958.

Diamonti, Michael C.
Assistant Professor of Education; B.A., Seton Hall University, 1967; M.Ed., Rutgers University, 1970; Ph.D., University of Wisconsin, 1974; appointed 1973.

Dickman, C. Meigs
Assistant Professor of Nursing; Diploma, Greenwich Hospital School of Nursing, 1965; B.S.N., University of Cincinnati, 1967; M.S.N., Boston University, 1972; appointed 1972.

Diller, Ann L.
Assistant Professor of Education; B.A., Maryville College, 1960; M.A., Tulsa University, 1962; Ed.D., Harvard, 1971; appointed 1973.

Diller, Karl C.
Associate Professor of English; B.A., University of Pittsburgh, 1961; Ed.M., Harvard University, 1964; Ph.D., ibid., 1967; appointed 1972.

Dingman, S. Lawrence
Assistant Professor of Water Management; A.B., Dartmouth College, 1960; A.M., Harvard University, 1961; Ph.D., ibid., 1970; appointed 1975.

Disanzo, Anthony
Lecturer in Italian; B.A., University of Massachusetts, 1970; M.A., Harvard University, 1972; appointed 1974.

Dishman, Robert B.
Professor of Political Science; A.B., University of Missouri, 1939; A.M., ibid., 1940; Ph.D., Princeton University, 1948; appointed 1951.

Dodds, John A.
Thompson School Associate Professor of Applied Animal Science; B.S., University of Vermont, 1936; M.Agr.Ed., University of New Hampshire, 1960; appointed 1953.

Dodge, Peter
Associate Professor of Sociology; B.A., Swarthmore College, 1948; A.M., Harvard University, 1950; Ph.D., ibid., 1961; appointed 1964.

Downs, Richard E.
Associate Professor of Anthropology; S.B., Harvard University, 1942; Cert. of Ethn., University of Paris, 1949; Ph.D., University of Leiden, 1956; appointed 1962.

Draves, David D.
Associate Professor of Education; B.A., University of Wisconsin, 1948; M.A., ibid., 1949; Ph.D., ibid., 1957; appointed 1964.

Drew, William H.
Associate Dean of the Graduate School and Professor of Resource Economics; B.S., Pennsylvania State College, 1947; M.S., Rutgers University, 1949; Ph.D., Vanderbilt University, 1961; appointed 1956.

†*Dunlop, William R.
Professor of Animal Science and Extension Poultry Pathologist; D.V.M., V.S., Ontario Veterinary College, 1938; appointed 1950.

†Dunn, Gerald M.
Professor of Plant Science; B.S., West Virginia University, 1948; M.S., Purdue University, 1950; Ph.D., ibid., 1951; appointed 1951.

Durgin, Owen B.
Professor of Resource Economics; B.S.Ed., Gorham State Teachers College, 1946; M.A., University of New Hampshire, 1951; appointed 1951.

Durnall, Edward J.
Director of the Division of Continuing Education and Associate Professor of Education; B.S., Hofstra University, 1947; M.A., Colorado College, 1948; Ed.M., Harvard University, 1952; Ed.D., Oregon State University, 1953; appointed 1966.

Durrell, Donald D.
Adjunct Professor of Education; A.B., University of Iowa, 1926; Ed.M., Harvard University, 1929; Ed.D., ibid., 1930; L.H.D. (Hon.), Boston University, 1969; appointed 1973.

Dusek, R. Valentine
Assistant Professor of Philosophy; B.A., Yale University, 1963; Ph.D., University of Texas, 1972; appointed 1966.

Dussault, Marjorie B.
Assistant Professor of Occupational Therapy; B.S., University of Toledo, 1961; B.S., Ohio State University, 1965; M.Ed., Ohio University, 1970; appointed 1971.

Eder, Sidney C.
Assistant Professor of Education; B.A., University of California at Los Angeles, 1957; M.Ed., University of Arizona, 1961; Ph.D., Arizona State University, 1971; appointed 1971.

Edwards, John C.
Director of Theater and Associate Professor of Speech and Drama; B.S., Northwestern University, 1950; M.A., ibid., 1952; Ph.D., ibid. 1963; appointed 1961.

Edwards, Ruth S.
Assistant Professor of Music; B.M., Northwestern University, 1949; M.M., ibid., 1950; appointed 1966.

Ellis, David W.
Vice Provost for Academic Affairs and Associate Professor of Chemistry; A.B., Haverford College, 1958; Ph.D., Massachusetts Institute of Technology, 1962; appointed 1962.

Emery, Harvard B.
Assistant Professor of Graphics; Cert. in M.E., Lowell Institute, 1938; appointed 1954.

***Engalichev, Nicolas**
Professor of Resource Economics and Extension Economist, Marketing (Forest Products); B.S., S.U.N.Y., College of Forestry, Syracuse University, 1957; M.S., ibid., 1960; appointed 1963.

Erickson, Raymond L.
Dean of Graduate School and Director of Research and Professor of Psychology; B.A., S.U.N.Y. at Buffalo, 1951; M.A., University of California at Los Angeles, 1954; Ph.D., ibid., 1962; appointed 1963.

†Estes, George O.
Associate Professor of Plant Science; B.S., University of Maine, 1958; M.S., ibid., 1960; Ph.D., Oregon State University, 1969; appointed 1969.

Evans, Rand B.
Associate Professor of Psychology; B.A., University of Texas (Austin), 1963; M.A., ibid., 1964; Ph.D., ibid., 1967; appointed 1972.

***Fairchild, Thomas P.**
Associate Professor of Animal Science and Extension Dairyman; B.S., University of New Hampshire, 1959; M.S., University of Wisconsin, 1961; Ph.D., ibid., 1964; appointed 1969.

Fan, Stephen S.T.
Associate Professor of Chemical Engineering; B.S., Stanford University, 1957; M.S., ibid., 1960; Ph.D., ibid., 1962; appointed 1962.

Federer, C. Anthony
Adjunct Associate Professor of Micrometeorology; B.S., University of Massachusetts, 1959; M.S., University of Wisconsin, 1962; Ph.D., ibid., 1964; appointed 1970.

Fernald, Peter S.
Associate Professor of Psychology; A.B., Amherst College, 1958; M.S., Springfield College, 1959; Ph.D., Purdue University, 1963; appointed 1966.

Fink, Stephen L.
Professor of Organizational Development, Associate Dean of the Whittemore School of Business and Economics; and Psychologist, Counseling and Testing Center; B.S., Union College, 1954; Ph.D., Case Western Reserve University, 1959; appointed 1969.

Finnegan, Theodore J.
Assistant Professor of Aerospace Studies; B.S., University of New Hampshire, 1948; M.S., ibid., 1955; appointed 1974.

Fisher, Lester A.
Assistant Professor of English; B.A., University of Maine, 1966; M.A., University of New Hampshire, 1970; Ph.D., Brown University, 1976; appointed 1968.

†*Fisher, G. Thomas
Associate Professor Entomology and Extension Entomologist; B.S., Iowa State University, 1950; M.S., Rutgers University, 1952; Ph.D., ibid., 1954; appointed 1969.

Fitzpatrick, Evelyn P.
Instructor in Nursing; Diploma, New England Deaconess Hospital, 1950; B.S., Boston University, 1954; appointed 1973.

Fogg, Marguerite F.
Associate Professor of Nursing; Diploma, Pillsbury Hospital School, 1940; Certificate, Hague Hospital, 1945; B.S., Boston College, 1957; M.S., ibid., 1960; appointed 1967.

Fogg, Miriam Kay
Adjunct Lecturer in Medical Technology; B.S., University of Vermont, 1967; M.T., (ASCP), 1967; appointed 1972.

Forbes, F. William
Assistant Professor of Spanish; A.B., Stanford University, 1965; M.A., University of Arizona, 1967; Ph.D., ibid., 1971; appointed 1970.

Ford, Joseph P.
Assistant Professor of Political Science; B.A., University of New Hampshire, 1956; M.P.A., Harvard University, 1957; appointed 1959-61, 1962.

Foret, John E.
Associate Professor of Zoology; A.B., University of New Hampshire, 1962; M.S., ibid., 1963; A.M., Princeton University, 1965; Ph.D., ibid., 1966; appointed 1967.

Forsyth, G. Alfred
Associate Professor of Psychology; B.A., Dickinson College, 1961; M.S., North Carolina State University, 1963; Ph.D., Purdue University, 1967; appointed 1967.

Fort, Marron C.
Associate Professor of German; A.B., Princeton University, 1961; Ph.D., University of Pennsylvania, 1965; appointed 1969.

†Foster, Bennett B.
Associate Professor of Forest Resources; B.S.F., Colorado State University, 1952; M.F., Oregon State University, 1957; Ph.D., Duke University, 1966; appointed 1969.

Francq, Edward N.
Assistant Professor of Zoology; B.S., University of Maryland, 1956; M.S., University of Idaho, 1962; Ph.D., Pennsylvania State University, 1967; appointed 1965.

French, E. Elizabeth
Adjunct Assistant Professor of Medical Technology; A.B., Skidmore College, 1943; M.T. (ASCP), Mary Hitchcock Memorial Hospital School of Med. Tech., 1944; M.D.C.M., McGill University Faculty of Medicine, 1950; appointed 1972.

Frick, George E.
Adjunct Professor of Resource Economics; B.S., University of Connecticut, 1943; M.S., ibid., 1947; appointed 1957.

Friel, Gerald J.
Head Basketball Coach and Lecturer in Physical Education; B.S., State University College, New York, 1966; appointed 1969.

Frost, Albert D.
Professor of Electrical Engineering; B.S., Tufts College, 1945; A.M. Harvard University, 1947; Sc.D., Massachusetts Institute of Technology, 1952; appointed 1957.

Gadon, Herman
Professor of Business Administration; A.B., Dartmouth College, 1947; Ph.D., Massachusetts Institute of Technology, 1957; appointed 1964.

Garrett, Peter W.
Adjunct Assistant Professor of Forest Genetics; B.S., Michigan State University, 1958; M.S., University of Michigan, 1962; Ph.D., ibid., 1969; appointed 1970.

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Associate Professor of Economics and Business Administration; B.S., Rose Polytechnic Institute, 1962; M.A., Indiana University, 1964; Ph.D., ibid., 1967; appointed 1967.

Milne, Lorus J.
Professor of Zoology; B.A., University of Toronto, 1933; M.A., Harvard University, 1934; Ph.D., ibid., 1936; appointed 1948.

Minocha, Subhash C.
Assistant Professor of Botany; B.S.C., Panjab University, 1968; M.S.C., ibid., 1969; Ph.D., University of Washington, 1974; appointed 1974.

***Mitchell, James R.**
Associate Professor of Plant Science and Extension Agronomist, Forage Crops; B.S., University of New Hampshire, 1957; M.S., Pennsylvania State University, 1960; Ph.D., ibid., 1969; appointed 1963.

Mooradian, Andrew T.
Director, Department of Intercollegiate Athletics, and Associate Professor of Physical Education; B.S., University of New Hampshire, 1948; M.S., Boston University, 1958; appointed 1950.

Moore, Asher
Donald C. Babcock Professor of Philosophy; A.B., Wesleyan University, 1940; M.A., Harvard University, 1942; Ph.D., ibid., 1948; appointed 1961.

Moore, Berrien, III
Associate Professor of Mathematics; B.S., University of North Carolina, 1963; Ph.D., University of Virginia, 1969; appointed 1969.

Moore, David W.
Assistant Professor of Political Science; B.S., U.S. Military Academy, 1962; M.A., Ohio State University, 1969; Ph.D., ibid., 1970; appointed 1972.

Moore, Donald A.
Adjunct Professor Whittemore School; Director, Center for Industrial and Institutional Development; B.S., Wayne State University, 1952; P.M.D., Harvard University, 1969; appointed 1969.

***Moore, Joseph J.**
Animal Pathologist and Lecturer; B.S., Trinity College, 1966; V.M.D., University of Pennsylvania, 1970; appointed 1975.

Morin, Robert R.
Assistant Professor, Catalog Librarian; B.A., University of New Hampshire, 1963; M.S., Simmons College, 1965; appointed 1965.

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Adjunct Assistant Professor of Resource Economics; B.S., Oklahoma State University, 1968; M.S., ibid., 1969; Ph.D., ibid., 1973; appointed 1972.

Morrison, James D.
Professor of Chemistry; B.S., Franklin and Marshall College, 1958; Ph.D., Northwestern University, 1962; appointed 1965.

Morse, Carl E. (Captain)
Lecturer in Military Science; B.A., University of California at Berkeley, 1967; M.S., Texas Tech University, 1974; appointed 1974.

Mosberg, William
Associate Professor of Mechanical Engineering; B.S.M.E., Columbia University, 1956; M.Eng., Yale University, 1958; appointed 1958.

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Dean, School of Health Studies, and Professor of Health Services Administration and Planning; A.B., Amherst College, 1949; M.P.A., John F. Kennedy School of Government, Harvard University, 1953; Ph.D., Harvard University 1967; appointed 1973.

Mower, Lyman
Professor of Physics; B.S., University of California, 1949; Ph.D., Massachusetts Institute of Technology, 1953; appointed 1957.

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Professor of Physics; B.S., Oklahoma Agricultural and Mechanical College, 1948; M.A., Boston University, 1949; Ph.D., ibid., 1954; appointed 1954.

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Professor of Mathematics; B.A., University of Texas, 1940; Sc.M., Brown University, 1941; Ph.D., ibid., 1945; appointed 1959.

Murdoch, Joseph B.
Professor of Electrical Engineering; B.S., Case Institute of Technology, 1950; M.S., University of New Hampshire, 1955; Ph.D., Case Institute of Technology, 1962; appointed 1952.

Murphy, Stephen J.
Assistant Professor of Education and Project Director Vocational Rehabilitation Counseling Project; B.A., Holy Cross College, 1966; M.A., Assumption College, 1967; Ph.D., S.U.N.Y. at Buffalo, 1973; appointed 1974.

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Professor of English; B.A., University of New Hampshire, 1948; appointed 1963.

Murray, Frederick P.
Associate Professor of Communication Disorders; B.A., Stanford University, 1948; M.A., University of Southern California, 1950; Ph.D., Denver University, 1966; appointed 1966.

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Assistant Professor of Electrical Engineering; B.S.E.E., Stanford University, 1962; M.S.E.E., California Institute of Technology, 1963; Ph.D., University of California, 1972; appointed 1975.

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Professor of Psychology; B.E., Yale University, 1954; M.A. Columbia University, 1961; Ph.D., ibid., 1963; appointed 1972.

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Dean of Students; B.A., Saint Joseph's College, 1967; M.Ed., Pennsylvania State University, 1969; appointed 1969.

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Associate Dean of the College of Liberal Arts and Associate Professor of Sociology; B.S., Bowling Green State University, 1942; M.A., Ohio State University, 1947; Ph.D., ibid., 1955; appointed 1950.

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Lecturer in Business Administration; A.B., Bowdoin University, 1965; M.B.A., University of New Hampshire, 1972; appointed 1970.

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Associate Professor of Economics; A.B., University of California at Berkeley, 1963; Ph.D., ibid., 1967; appointed 1972.

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Professor of Mathematics; B.Ch.E., Polytechnic Institute of Brooklyn, 1956; Ph.D., University of Michigan, 1964; appointed 1964.

Norton, Robert C.
Assistant Coach and Lecturer in Physical Education; B.A. Rutgers University, 1965; M.Ed., Boston State College, 1972; appointed 1970.

O'Brien, Dennis J.
Assistant Professor of Civil Engineering; B.S., Rensselaer Polytechnic Institute, 1968; M.S., College Park, University of Maryland, 1970; Ph.D., ibid., 1974; appointed 1974.

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Associate Professor of Political Science; B.A., University of New Hampshire, 1956; Ph.D., Syracuse University, 1968; appointed 1966.

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Assistant Football Coach and Lecturer in Physical Education; B.A., University of New Hampshire, 1967; M.Ed., Boston State College, 1971; appointed 1972.

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Associate Professor of Animal Science; B.S., University of New Hampshire, 1937; D.V.M., University of Pennsylvania, 1941; appointed 1969.

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Associate Professor of Home Economics and Extension Interior Design Specialist; B.S., Cornell University, 1946; M.S., University of Wisconsin, 1952; M.S., ibid., 1955; appointed 1961.

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Associate Professor of Wildlife Ecology; and Director, Institute of Natural and Environmental Resources; B.S., University of Minnesota,1954; M.S., University of Maine, 1958; Ph.D., University of Minnesota, 1964; appointed 1968.

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Instructor in Hotel Administration; B.S., Cornell University, 1968; M.B.A., University of Pennsylvania, 1970; appointed 1973.

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Associate Professor of Civil Engineering; B.C.E., Syracuse University, 1963; M.S., University of Connecticut, 1967; Ph.D., Carnegie-Mellon University, 1970; appointed 1975.

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Associate Professor of Chemistry; B.S., Colorado College, 1957; Ph.D., University of Kansas, 1963; appointed 1963.

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Pfanner, Helmut F.
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Associate Professor of Nursing and Curriculum; R.N., Hospital for Women, Maryland, 1949; B.S., Duke University, 1953; M.N., University of Washington, 1955; D.N.Sc., Boston University, 1971; appointed 1974.

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Associate Dean College of Health Studies, and Associate Professor of Health Studies; B.A., University of Louisville, 1962; Ph.D., ibid., 1968; M.Ph., Johns Hopkins University, 1970; appointed 1974.

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Plager, Dean
Instructor in Administration; B.S., Iowa State College, 1965; M.B.A., University of Denver, 1970; appointed 1975.

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Associate Professor of Electrical Engineering; B.S., St. Louis University, 1959; M.S., Arizona State University, 1965; Ph.D., Montana State University, 1967; appointed 1967.

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Associate Professor of Music; B.A., San Diego State College, 1956; M.M., University of Wisconsin, 1958; Ph.D., University of California at Berkeley, 1968; appointed 1964.

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Assistant Professor of Plant Science; A.B., Duke University, 1965; Ph.D., University of Florida, 1969; appointed 1970.

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Instructor in Hotel Administration; A.S., Dean Jr. College, 1968; B.S., Babson College, 1970; M.B.A., Michigan State, 1972; appointed 1974.

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Assistant Vice Provost for Academic Affairs and Adjunct Associate Professor of Zoology; B.S., Portland State University, 1962; M.S., Oregon State University, 1964; Ph.D., ibid., 1966; appointed 1972.

Potter, Hugh M., III
Assistant Professor of English; A.B., Union College, 1954; M.A., University of North Carolina, 1957; Ph.D., University of Minnesota, 1965; appointed 1962.

Powell, Stephen Alonzo
Assistant Professor and Special Collections Librarian; B.A., Hamilton College, 1955; M.S.L.S., Rutgers University, 1961; appointed 1974.

Prince, Allan B.
Vice Provost for Budget and Administration and Professor of Soil and Water Science; B.S., Rutgers University, 1947; Ph.D., ibid., 1950; appointed 1954.

Pritchard, Hugh C.
Professor, Reference Librarian; B.A., University of Washington, 1939; M.A., University of North Carolina, 1942; M.S., Columbia University, 1950; appointed 1954.

Puth, Robert C.
Associate Professor of Economics; B.A., Carleton College, 1958; M.A., Northwestern University, 1965; Ph.D., ibid., 1967; appointed 1967.

Radlow, James
Professor of Applied Mathematics; B.A., City College, New York, 1943; Sc.M., Brown University, 1946; Ph.D., New York University, 1957; appointed 1965.

Ragonese, Carmen D.
Director of Alumni Affairs; B.A., University of New Hampshire, 1949; M.S., Air Force Institute of Technology, 1965; appointed 1973.

Rasmussen, Mary H.
Associate Professor of Music; B.A., University of New Hampshire, 1952; M.M., University of Illinois, 1953; M.L.S., ibid., 1956; appointed 1968.

Reed, Robert C.
Associate Professor, Acquisitions Librarian; B.A., Hartwick College, 1953; M.A.L.S., University of Michigan, 1960; appointed 1960.

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Associate Professor of Entomology and Forest Resources; B.S., S.U.N.Y. College of Forestry, Syracuse University, 1957; M.S., Cornell University, 1961; Ph.D., S.U.N.Y. College of Forestry, Syracuse University, 1964; appointed 1964.

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Assistant Professor of Animal Science; B.S., University of Toledo, 1967; Ph.D., Cornell University, 1972; appointed 1972.

Resch, John P.
Assistant Professor of History, Merrimack Valley Branch; B.A., Denison University, 1962; M.A., Ohio State University, 1965; Ph.D., ibid., 1969; appointed 1972.

Reyna, Stephen P.
Assistant Professor of Anthropology; A.B., Columbia College, 1965; Ph.D., Columbia University, 1972; appointed 1973.

Rich, Avery E.
Professor of Plant Pathology and Associate Dean, College of Life Sciences and Agriculture; B.S., University of Maine, 1937; M.S., ibid., 1939; Ph.D. State University, Washington, 1950; appointed 1941-43, 1951.

Richardson, John C.
Professor of English; A.B., Dartmouth College, 1941; M.A., Columbia University, 1942; Ph.D., Boston University, 1959; appointed 1946.

Rick, Judith
Instructor in Nursing; B.S., Illinois Wesleyan University, 1970; M.S., Boston University, 1972; appointed 1974.

Rilling, Jean M.
Lecturer and Coach in Physical Education; Degree, University of Liverpool, 1955; appointed 1967.

Roberts, Elizabeth
Assistant Professor of Social Services; B.A., West Virginia University, 1953; M.S.W., ibid., 1970; Ph.D., Brandeis University, 1975; appointed 1974.

Roberts, Lewis, Jr.
Thompson School Associate Professor of Applied Science and Director of Thompson School of Applied Science; B.A., Brown University, 1959; M.Ed., Auburn University, 1970; Ed.D., ibid., 1972; appointed 1972.

Robinson, Frederick J.
Associate Director, Merrimack Valley Branch, and Associate Professor of Mathematics; B.S., University of New Hampshire, 1949; M.A., ibid., 1955; appointed 1949.

Roe, Gene V.
Thompson School Instructor in Civil Technology; B.S., Worcester Polytechnic Institute, 1972; M.S., University of Connecticut, 1974; appointed 1975.

Rogers, Ada-Louise H.
Assistant Professor of Music; B.A., B.M., Brenau College, 1944; M.S., Juilliard School of Music, 1949; appointed 1967.

Rogers, John E.
Associate Professor of Music; B.A., B.M., University of Georgis, 1960; M.M., Yale University, 1962; M.F.A., Princeton University, 1966; appointed 1967.

†Rogers, Owen M.
Professor of Plant Science; B.V.A., University of Massachusetts, 1952; M.S., Cornell University, 1954; Ph.D., Pennsylvania State University, 1959; appointed 1959.

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Thompson School Assistant Professor of Communications; B.A., St. Joseph's College, 1941; M.A., University of South Florida, 1968; appointed 1971.

Romoser, George K.
Professor of Political Science; A.B., Rutgers University, 1951; A.M., University of Chicago 1954; Ph.D., ibid., 1958; appointed 1961-62, 1967.

Rondeau, Lawrence A.
Assistant Professor of Recreation and Parks; B.S., Springfield College, 1964; M.S., Indiana University, 1965; appointed 1975.

Rosen, Sam
Professor of Economics; B.A., University of Wisconsin, 1942; M.A., Harvard University, 1942; Ph.D., ibid., 1952; appointed 1957.

Rosenbush, Michael J.
Associate Professor of Russian; B.A., McGill University, 1957; M.A., Universite de Montreal, 1964; Ph.D., ibid., 1970; appointed 1972.

Ross, Shepley L.
Professor of Mathematics; A.B., Boston University, 1949; A.M., ibid., 1950; Ph.D., ibid., 1953; appointed 1955.

Rothwell, Kenneth J.
Professor of Economics; B.A., University of Western Australia, 1949; M.A., ibid., 1954; Ph.D., Harvard University, 1960; appointed 1963.

Rouman, John C.
Associate Professor of Classics; B.A., Carleton College, 1950; M.A., Columbia University, 1951; Ph.D., University of Wisconsin, 1965; appointed 1965.

†Routley, Douglas G.
Professor of Plant Science; B.S.A., University of British Columbia, 1952; M.S., Pennsylvania State University, 1953; Ph.D., ibid., 1957; appointed 1957.

Rupp, Nancy C.
Assistant Professor of Physical Education; B.S., Sargent College, Boston University, 1950; M.A., State University of Iowa, 1955; appointed 1970.

Russell, Robert D.
Assistant Professor of Mathematics; B.A., Yale University, 1965; M.S., Stanford University, 1967; Ph.D., ibid., 1972; appointed 1975.

Rutman, Darrett B.
Professor of History; A.B., University of Illinois, 1950; Ph.D., University of Virginia, 1959; appointed 1968.

Samuels, Fred
Associate Professor of Sociology; B.S., City College of New York, 1950; M.A., University of Hawaii, 1963; Ph.D., University of Massachusetts, 1966; appointed 1966.

Sandler, Mel
Professor of Hotel Administration; B.S., Georgetown University, 1941; M.A., Northwestern University, 1947; C.P.A.; appointed 1970.

Sasner, John J., Jr.
Associate Professor of Zoology; B.A., University of New Hampshire, 1957; M.S., ibid., 1959; Ph.D., University of California, 1965; appointed 1965.

Savage, Eugene Arnold
Director of Admissions; B.Ed., Plymouth State College, 1958; M.Ed., Boston University, 1963; appointed 1967.

Savage, Godfrey H.
Professor of Mechanical Engineering and Director of E.D.A.L.; B.S.E., Princeton University, 1950; M.S., Stanford University, 1951; M.B.A., Harvard University, 1954; Engr., Stanford University, 1963; Ph.D., ibid., 1970; appointed 1965.

Sawyer, Albert K.
Professor of Chemistry; A.B., Colby College, 1940; M.S., University of Maine, 1947; appointed 1949.

Sawyer, Philip J.
Professor of Zoology; B.S., University of New Hampshire, 1940; M.S., ibid., 1948; Ph.D., University of Michigan, 1956; appointed 1952.

Scatton, Linda H.
Lecturer in German and Russian; A.B., University of Pennsylvania, 1964; M.A., Harvard University, 1966; appointed 1974.

Scharff, Robert C.
Associate Professor of Philosophy; A.B., University of Illinois, 1961; M.A., Northwestern University, 1965; Ph.D., ibid., 1970; appointed 1970.

Schibanoff, Susan
Assistant Professor of English; B.A., Cornell University, 1966; M.A., University of California at Los Angeles, 1967; Ph.D., ibid., 1971; appointed 1971.

Schickedanz, David I.
Assistant Professor of Psychology; B.S., University of Illinois, 1967; M.A., ibid., 1970; Ph.D., University of Illinois at Champaign-Urbana, 1973; appointed 1973.

Schmidt, Marty J.
Assistant Professor of Psychology; B.S., Purdue University, 1968; M.S., ibid., 1970; Ph.D., ibid., 1972; appointed 1972.

Schneer, Cecil J.
Professor of Geology; A.B., Harvard University, 1943; A.M., ibid., 1949; Ph.D., Cornell University, 1954; appointed 1950, 1954.

Schomaker, Linda
Instructor in Home Economics; B.S., State University of New York at Plattsburg, 1967; M.A., University of Connecticut, 1968; appointed 1972.

Schreiber, Richard W.
Professor of Botany; B.S., University of New Hampshire, 1951; M.S., ibid., 1952; Ph.D., University of Wisconsin, 1955; appointed 1957.

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Assistant Professor of Animal Sciences; B.S., University of Wisconsin, 1969; M.S., ibid., 1970; Ph.D., ibid., 1974; appointed 1975.

Schwarz, Marc L.
Associate Professor of History; A.B., Bates College, 1959; A.M.T., Harvard University, 1960; Ph.D., University of California at Los Angeles, 1965; appointed 1967.

Scott, William H.
Thompson School Assistant Professor of Applied Business Management; B.S., Drexel Institute of Technology, 1961; M.Ed., University of New Hampshire, 1973; appointed 1970.

Searls, Maryse P.
Instructor in The Arts; B.F.A., Cleveland Institute of Art, 1971; M.F.A., Alfred University, 1973; appointed 1973.

Seiler, David E.
Associate Professor of Music; B.M., University of Wisconsin, 1961; M.M., ibid., 1965; appointed 1972.

Shapiro, Howard M.
Associate Professor of Sociology; B.A., Brandeis University, 1964; M.A., Boston University, 1966; Ph.D., University of Minnesota, 1969; appointed 1969.

Shar, Albert O.
Assistant Professor of Mathematics; B.A., Brandeis University, 1965; M.A., Fordham University, 1966; Ph.D., University of Pennsylvania, 1970; appointed 1971.

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Associate Professor of The Arts; B.S., Iowa State College, 1945; M.F.A., Cranbrook Academy of Art, 1953; appointed 1954.

Shepard, Harvey K.
Associate Professor of Physics; B.S., University of Illinois, 1960; M.S., California Institute of Technology, 1962; Ph.D., ibid., 1966; appointed 1969.

Sherman, Heidemarie C.
Assistant Professor of Economics; B.A., Wayne State University, 1959; B.A., ibid., 1962; M.A., ibid., 1965; Ph.D., ibid., 1970; appointed 1967.

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Shigo, Alex L.
Adjunct Professor of Plant Pathology; B.S., Waynesburg College, 1956; M.S., West Virginia University, 1958; Ph.D., ibid., 1959; appointed 1966.

Shor, Ronald E.
Professor of Psychology; B.A., Brandeis University, 1953; M.A., Kansas University, 1955; Ph.D., Brandeis University, 1960; appointed 1967.

Shore, Barry
Associate Professor of Administration; B.S.E.E., Tufts University, 1960; M.B.A., University of Massachusetts, 1963; Ph.D., University of Wisconsin, 1968; appointed in 1974.

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Silver, Judith A.
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Professor of Mathematics; B.S., University of Chicago, 1947; M.S., ibid., 1948; Ph.D., University of Illinois, 1952; appointed 1962.

Simic, Charles
Associate Professor of English; B.A., New York University, 1967; appointed 1973.

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Associate Professor of Physics; B.S., University of Rochester, 1955; A.M., Harvard University, 1956; Ph.D., ibid., 1960; appointed 1963.

Sims, Wilburn L.
Assistant Professor of Speech and Drama; A.B., Dartmouth College, 1964; M.S.T., University of New Hampshire, 1969; appointed 1967.

Singer, Frank P.
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Sir, W. Niel
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Instructor in Home Economics; B.S., University of Minnesota, 1974; appointed 1975.

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Associate Professor of Social Service; B.S., University of New Hampshire 1950; M.S., Boston University School of Social Work, 1959; appointed 1959.

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Stephens, James
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Stevens, Richard F.
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Stone, Deborah E.
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Professor of Sociology; B.A., University of Wisconsin, 1948; M.S., ibid., 1949; Ph.D., ibid., 1956; appointed 1968.

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Professor of Animal Science; B.S., University of Maine, 1950; M.S., University of New Hampshire, 1954; Ph.D., ibid., 1961; appointed 1954.

Swan, Emery F.
Professor of Zoology; S.B., Bates College, 1938; Ph.D., University of California, 1942; appointed 1952.

Swift, M. Robinson
Lecturer in Mechanical Engineering; B.S., University of New Hampshire, 1971; Ph.D., ibid., 1974; appointed 1975.

Taft, Charles K.
Professor of Mechanical Engineering; B.A., Amherst College, 1951; B.S., Massachusetts Institute of Technology, 1953; M.S., Case Institute of Technology, 1956; Ph.D., ibid., 1960; appointed 1967.

Taube, Gerald
Adjunct Associate Professor of Health Studies; B.A., University of Pennsylvania, 1961; J.D., Boston University Law School, 1964; M.S.W., Brandeis University, 1972; Ph.D., ibid., 1972; appointed 1975.

Taylor, William H.
Lecturer in Physics; B.S., University of New Hampshire, 1970; appointed 1969.

Tebbetts, Diane R.
Assistant Professor, Assistant Reference Librarian; B.A., University of New Hampshire, 1965; M.S., Simmons College, 1972; appointed 1971.

Teeri, Arthur E.
Professor of Biochemistry; B.S., University of New Hampshire, 1937; M.S., ibid., 1940; Ph.D., Rutgers University, 1943; appointed 1938-40, 1943.

Thomas, George R.
Professor of The Arts; B.Arch., Carnegie Institute of Technology, 1930; appointed 1930.

Thompson, Allen
Assistant Professor of Economics; B.A., Austin College, 1966; Ph.D., University of Texas, Austin, 1973; appointed 1974.

Tillinghast, Edward K.
Associate Professor of Zoology; B.S., University of Rhode Island, 1955; M.S., ibid., 1959; Ph.D., Duke University, 1966; appointed 1967.

Tischler, Herbert
Professor of Geology; B.S., Wayne State University, 1950; M.A., University of California, 1955; Ph.D., University of Michigan, 1961; appointed 1965.

Tokay, F. Harry
Associate Professor of Communication Disorders; B.S., St. Cloud State College, 1960; M.A., Michigan State University, 1962; Ph.D., ibid., 1967; appointed 1973.

Trout, Ben T.
Assistant Professor of Political Science; B.A., University of California, 1961; M.A., Indiana University, 1968; Ph.D., Indiana University, 1972; appointed 1969.

Turner, Leslie C.
Registrar; B.A., University of Massachusetts, 1961; M.Ed., ibid., 1967; appointed 1968.

Uebel, J. John
Professor of Chemistry; B.A., Carthage College, 1959; Ph.D., University of Illinois, 1964; appointed 1964.

Ulrich, Gail D.
Assistant Professor of Chemical Engineering; B.S., University of Utah, 1959; M.S., ibid., 1962; Sc.D., Massachusetts Institute of Technology, 1964; appointed 1970.

†Urban, Willard E., Jr.
Associate Professor of Biometrics and Assistant Director, Agricultural Experiment Station; B.S., Virginia Polytechnic Institute, 1958; M.S., Iowa State University, 1960; Ph.D., ibid., 1963; appointed 1963.

Ury, Ann D.
Associate Professor of Occupational Therapy; B.S., University of New Hampshire, 1956; M.A., Brown University, 1968; CAGS, Rhode Island College, 1973; appointed 1973.

Valentine, Russell L.
Associate Professor of Mechanical Engineering; Certificate in Machine Design, Wentworth Institute, 1942; B.S., Michigan State University, 1951; M.S.M.E., Purdue University, 1953; appointed 1953.

Valenza, Daniel L.
Associate Professor of The Arts; A.A.S., School for American Craftsmen at Rochester Institute of Technology, 1956; B.F.A., ibid., 1958; M.F.A., ibid., 1966; appointed 1959.

Van Osdol, Donavan Harold
Associate Professor of Mathematics; A.B., Earlham College, 1964; A.M., University of Illinois, 1966; Ph.D., ibid., 1969; appointed 1970.

Verrette, Paul F.
Assistant Professor of Music; B.A., University of New Hampshire, 1952; M.A., Boston University, 1971; appointed 1962.

Viccaro, Thomas J.
Assistant Professor of Social Services; B.A., Queens College, 1965; M.A., ibid., 1967; M.S.W., University of Michigan, 1970; appointed 1972.

Vincent, Donald E.
Professor, University Librarian; B.A., S.U.N.Y. at Buffalo, 1949; A.M.L.S., University of Michigan, 1952; A.M., ibid., 1957; Ph.D., ibid., 1974; appointed 1962.

Voll, John O.
Associate Professor of History; B.A., Dartmouth College, 1958; M.A., Harvard University, 1960; Ph.D., ibid., 1969; appointed 1965.

Vreeland, Robert P.
Associate Professor of Civil Engineering; B.S., Yale University, 1932; M.S., Columbia University, 1933; M.E., Yale University, 1941; appointed 1966.

Vrooman, Jack R.
Associate Professor of French; A.B., Princeton University, 1951; M.A., Columbia University, 1952; Ph.D., Princeton University, 1965; appointed 1971.

Walker, Ian M.
Assistant Professor of The Arts; B.S., University of Rhode Island, 1958; M.F.A., Rochester Institute of Technology, 1968; appointed 1969.

†Wallace, Oliver P., Sr.
Associate Professor of Forest Resources; B.S., University of New Hampshire, 1937; B.S.F., University of Michigan, 1938; M.F., ibid., 1947; Ph.D., ibid., 1954; appointed 1958.

Wallace, William H.
Professor of Geography; B.S., Beloit College, 1948; M.S., University of Wisconsin, 1950; Ph.D., ibid., 1956; appointed 1957.

Wang, Rosemary Y.
Associate Professor of Nursing; Diploma in Nursing, Good Samaritan Hospital, Cincinnati, 1957; B.S., College of Mt. St. Joseph, 1959; M.S., Boston College, 1962; appointed 1971.

Wang, Tung-Ming
Associate Professor of Civil Engineering; B.S.C.E., National Chiao-Tung University, 1945; M.S.C.E., University of Missouri, 1954; Ph.D., Northwestern University, 1960; appointed 1961.

Ward, Elizabeth A.
Adjunct Clinical Instructor in Medical Technology; B.S., University of New Hampshire, 1947; M.T. (ASCP), 1947; appointed 1972.

Ward, Judith D.
Instructor in Occupational Therapy; B.S., University of New Hampshire, 1964; appointed 1972.

Waterfield, D. Allan
Assistant Professor of Physical Education; B.A., Ohio Wesleyan University, 1962; M.S., Springfield College, 1965; appointed 1970.

Watson, Deborah
Assistant Professor, Catalog Librarian; B.A., University of New Hampshire, 1963; M.A., ibid., 1967; M.S., Simmons College, 1972; appointed 1967.

Wear, Robert E.
Associate Professor of Physical Education; B.A., Oberlin College, 1941; M.A., University of Michigan, 1946; Ph.D., ibid., 1955; appointed 1964.

Webb, Dwight
Associate Professor of Education; B.A., University of Redlands, 1955; M.A., ibid., 1956; Ph.D., Stanford University, 1967; appointed 1967.

Webber, Laurance E.
Research Professor, Center for Industrial and Institutional Development; B.S., University of New Hampshire, 1934; M.E., ibid., 1940; M.S., ibid., 1946; appointed 1937.

Webber, William R.
Professor of Physics; B.S., Coe College, 1951; M.S., University of Iowa, 1955; Ph.D., ibid., 1957; appointed 1969.

Weber, James H.
Associate Professor of Chemistry; B.S., Marquette University, 1959; Ph.D., Ohio State University, 1963; appointed 1963.

Weber, Stephen J.
Assistant Professor of Psychology and Sociology; H.A.B., Xavier University, 1967; M.A., Northwestern University, 1969; Ph.D., ibid., 1971; appointed 1971.

***Weeks, Silas B.**
Associate Professor of Resource Economics and Extension Community Resource Development Specialist; B.S., Cornell University, 1937; appointed 1955.

Weesner, Theodore W.
Associate Professor of English; B.A., Michigan State University, 1959; M.F.A., University of Iowa, 1965; appointed 1966.

Weiland, Walter E.
Associate Professor of Physical Education; B.S., S.U.N.Y. at Cortland, 1957; M.S., Pennsylvania State University, 1958; Ph.D., ibid., 1964; appointed 1964.

Weiss, Tracey
Instructor in Speech & Drama; B.S., Temple University, 1971; M.A., ibid., 1973; appointed 1975.

Wells, Donald D.
Instructor in Business Administration; B.S., University of Connecticut, 1966; M.B.A., ibid., 1968; appointed 1971.

***†Wells, Otho S.**
Associate Professor of Plant Science and Extension Horticulturist, Vegetables; B.S., North Carolina State University, 1961; M.S., Michigan State University, 1963; Ph.D., Rutgers University, 1966; appointed 1966.

West, James R.
Assistant Professor of Music; B.M., American University, 1969; B.M.Ed., ibid., 1969; M.M., Northeastern University, 1972; appointed 1973.

West, Wilfred W. (Lt. Colonel, USA)
Professor of Military Science; B.S., Washington State, 1952; M.B.A., University of Arizona, 1961; appointed 1972.

Wetzel, William E.
Associate Professor of Business Administration; B.A., Wesleyan University, 1950; M.B.A., Temple University, 1965; M.B.A., University of Chicago, 1967; appointed 1967.

†Weyrick, Richard R.
Associate Professor of Forest Resources; B.S., University of Minnesota, 1953; M.F., ibid., 1961; Ph.D., ibid., 1968; appointed 1970.

Wheeler, Charles M., Jr.
Professor of Chemistry; B.S., West Virginia University, 1947; M.S., ibid., 1949; Ph.D., ibid., 1951; appointed 1950.

Wheeler, Douglas L.
Professor of History; A.B., Dartmouth College, 1959; A.M., Boston University, 1960; Ph.D., ibid., 1963; appointed 1965.

Wheeler, Ellsworth H., Jr.
Assistant Professor of Zoology; A.B., Dartmouth College, 1957; Ph.D., University of Rhode Island, 1968; appointed 1970.

Whitaker, William E.
Lecturer in Military Science; B.A., Dartmouth College, 1967; M.B.A., University of New Hampshire, 1975; appointed 1975.

White, Susan O.
Assistant Professor of Political Science; A.B., Bryn Mawr College, 1958; M.A., University of Minnesota, 1966; Ph.D., ibid., 1970; appointed 1969.

Whitlock, John B.
Associate Professor of Music; B.Ed., Southern Illinois Normal University, 1937; M.A., State University of Iowa, 1941; Ph.D., ibid. 1958; appointed 1958.

Whittier, Duane H.
Associate Professor of Philosophy; B.A., University of New Hampshire, 1950; M.A., University of Illinois, 1952; Ph.D., ibid., 1961; appointed 1967.

Wicks, John D.
Professor of Music; A.B., Harvard University, 1944; A.M., ibid., 1947; Ph.D., ibid., 1959; appointed 1956.

†Wight, Thomas
Assistant Professor of Animal Science; B.A., University of Maine, 1966; M.S., University of New Hampshire, 1968; Ph.D., ibid., 1972; appointed 1972.

Wilcox, Donald J.
Professor of History; A.B., Wesleyan University, 1961; A.M., Harvard University, 1962; Ph.D., ibid., 1967; appointed 1970.

Williams, Daniel C.
Associate Professor of Psychology; B.A., Northwestern University, 1966; Ph.D., University of California at Santa Barbara, 1970; appointed 1970.

Williams, Thomas A., Jr.
Professor of English; B.A., University of New Hampshire, 1950; M.A., ibid., 1958; appointed 1958.

Willits, Robin D.
Professor of Business Administration; A.B., Middlebury College, 1947; B.S., Massachusetts Institute of Technology, 1948; Ph.D., ibid., 1965; appointed 1965.

Wilson, John A.
Associate Professor of Mechanical Engineering; B.S., Tufts University, 1958; M.S., Northeastern University, 1960; Ph.D., ibid., 1970; appointed 1960.

Wing, Barbara H.
Lecturer in Spanish; B.A., Middlebury College, 1955; M.A.T., Harvard University, 1956; M.A., Middlebury College, 1971; appointed 1970.

Wing, Henry J., Jr.
Associate Professor of Music; B.M., Oberlin Conservatory, 1952; M.M., ibid., 1953; Ph.D., Boston University, 1966; appointed 1970.

Winn, Alden L.
Professor of Electrical Engineering; B.S., University of New Hampshire, 1937; S.M., Massachusetts Institute of Technology, 1948; appointed 1948.

Woodward, William R.
Instructor in Psychology; B.A., Harvard University, 1967; M.A., Princeton University, 1969; Ph.M., Yale University, 1973; Ph.D., ibid., 1975; appointed 1975.

Wright, John J.
Assistant Professor of Physics; B.S., Worcester Polytechnic Institute, 1965; Ph.D., University of New Hampshire, 1969; appointed 1970.

Wright, Paul A.
Professor of Zoology; S.B., Bates College, 1941; A.M., Harvard University, 1942; Ph.D., ibid., 1944; appointed 1958.

Wrightsman, Dwayne E.
Professor of Finance; B.S., Manchester College, 1958; M.B.A., Indiana University, 1959; Ph.D., Michigan State University, 1964; appointed 1964.

Wurzburg, Frederic W.
Associate Professor of Political Science; B.S., Columbia University, 1956; Ph.D., ibid., 1961; appointed 1963.

Wyman, Charles E.
Assistant Professor of Chemical Engineering, B.S., University of Massachusetts; 1967; M.A., Princeton University, 1969; Ph.D., ibid., 1971; appointed 1974.

Yamamoto, Yutaka
Assistant Professor of Philosophy; B.S., University of California at Berkeley, 1957; M.A., University of Michigan, 1967; Ph.D., ibid., 1973; appointed 1973.

Yang, Jane C.
Assistant Professor, Catalog Librarian; B.A., Taiwan Normal University, 1961; M.S., Southern Illinois University, 1961; M.S.L.S., Pratt Institute, 1963; appointed 1966.

Yildiz, Asim
Professor of Mechanics; Dipl., Technical University of Istanbul, 1953; D. Eng., Yale University, 1959; appointed 1967.

Yildiz, Musa
Senior Research Fellow; B.S., St. Louis University, 1951; M.S., ibid., 1952; Ph.D., Stevens Institute of Technology, 1967; appointed 1972.

Young, Arthur P.
Head Coach Swimming and Lacrosse, and Lecturer; B.A., Ohio Weslayan University, 1972; M.Ed., Springfield College, 1974; appointed 1974.

Yount, John A.
Professor of English; B.A., Vanderbilt University, 1960; M.F.A., State University of Iowa, 1962; appointed 1962-64, 1965.

Zabarsky, Melvin J.
Professor of The Arts; B.F.A., Boston University, 1958; M.F.A., University of Cincinnati, 1960; appointed 1969.

Zaso, Gus C.
Associate Professor of Recreation and Parks; A.B., Syracuse University, 1957; M.A., Central Michigan University, 1962; Re.D., Indiana University, 1965; appointed 1970.

Zavin, Shirley A.
Assistant Professor of The Arts; B.A., University of Michigan, 1954; M.A., ibid., 1965; Ph.D., Columbia University, 1972; appointed 1973.

Zoller, J. Harold
Professor of Civil Engineering; B.S.C.E., University of Wyoming, 1941; B.S.S.E., University of Illinois, 1945; P.E., University of Wyoming, 1947; Ph.D., University of Wisconsin, 1953; appointed 1958.

Zsigray, Robert M.
Assistant Professor of Microbiology; A.B., Miami University, 1961; M.S., Georgetown University, 1967; Ph.D., ibid., 1969; appointed 1970.

Cooperative Extension Staff

Barker, Floyd V., B.S.
Extension Environment Specialist; appointed 1967.

Black, Donald C., B.S.
Forester, Strafford County; appointed 1971.

Breck, Robert W., B.S., M.F.
Forester, Hillsborough County; appointed 1947.

Brown, Nancy C., B.S.
Extension Agent, Nutrition Education; appointed 1972.

Brushett, Lynda A., B.A., M.A.
Community Development Agent, Strafford County; appointed 1975.

Buck, Charles W., B.S., M.S.
4-H Youth Development Agent, Hillsborough County; appointed 1955.

Butterfield, Marcius R., B.S., M.S.
Program Specialist, 4-H and NHEMIS Coordinator; appointed 1962.

Buxton, David L., A.A.S., B.S.
Assistant Forester, Hillsborough County; appointed 1975.

Clark, Virginia E., B.E.
Extension Home Economist, Merrimack County; appointed 1963.

Clement, Bruce A., B.S.
Agricultural Agent, Cheshire County; appointed 1971.

Colby, Perley D., B.S.
Agricultural Agent, Hillsborough County; appointed 1953.

Conde, John A., A.A.S., B.S.
Forester, Merrimack County; appointed 1970.

Cook, Harold W., B.S.
Assistant Specialist, Forest Marketing and Utilization (Sawmill); appointed 1975.

Cook, Kathleen D., B.S.
4-H Youth Development Agent, Merrimack County; appointed 1973.

Corrow, Henry W., Jr., B.S.
Extension Editor; appointed 1953.

Crawford, Candace T., B.S.
Extension Home Economist, Sullivan County; appointed 1974.

Cullen, James B., A.A.S., B.S.F.
Associate Forester, Grafton County; appointed 1975.

Currier, Muriel B., B.S.
Extension Home Economist, Grafton County; appointed 1951-52, 1953.

Damon, John F., B.S.
Program Leader, Agriculture and Research Development; appointed 1961.

Danko, Thomas, B.S., M.S.
Extension Area Agent, Poultry Management; appointed 1957.

Dodge, Arthur G., Jr., A.A., B.S., M.S.F.
Extension RC & D Area Forester; appointed 1960.

Ellison, Daniel G., B.A., M.S.
Extension Resource Development Area Agent; appointed 1972.

Fabrizio, Richard F., B.V.A.
4-H Youth Development Agent, Grafton County; appointed 1965.

Farrey, Judith E., B.S.
4-H Program Assistant, Cheshire County; appointed 1973.

Ferguson, John R., Jr., B.S.
Forester, Cheshire County; appointed 1965.

Fortin, Sarah L., B.A.
4-H Youth Development Agent, Hillsborough County; appointed 1972.

Foster, Lenette N., B.S.
Coordinator, expanded Nutrition Program; appointed 1972.

Garland, Lynn B., B.S.
4-H Youth Development Agent, Rockingham County; appointed 1969.

George, Ernest A., B.S.
Extension Dairy Area Agent; Cheshire, Hillsborough, Rockingham, and Strafford counties; appointed 1955.

Gilman, Francis E., B.S.
Extension Agricultural Engineer; appointed 1969.

Grass, Carolyn K., B.A.
Extension Agent, Nutrition Education; appointed 1972.

Grady, James E., B.S.
County 4-H Youth Development Agent, Belknap County; appointed 1972.

Halford, Nicholas S., B.S.
Urban 4-H Youth Development Agent, Manchester; appointed 1973.

Head, Ivan E., B.S., M.Ag.Ed.
4-H Youth Development Agent, Sullivan County; appointed 1963.

Howe, Gerald W., B.S., M.S.
Agricultural Agent, Strafford County; appointed 1972.

Josselyn, Margaret B., B.S., M.A.
Clothing and Textiles Specialist; appointed 1975.

Kendall, Shirley M., B.S.
Extension Home Economist, Cheshire County; appointed 1968.

Kennedy, Kevin B., B.S.A.
Extension Dairy Area Agent; Grafton and Coos counties; appointed 1955.

Killam, Katherine W., V.S., M.S.
4-H Program Assistant; Sullivan County; appointed 1974.

Kincade, Merle F., B.E.
Extension Home Economist, Belknap County; appointed 1971.

Kinder, Richard G., B.S.
Assistant Specialist, Forest Marketing and Utilization (Harvesting); appointed 1971.

Knowles, Stanley W., B.S., M.S.
Forester, Rockingham County; appointed 1961.

Knox, Harry B., B.S.
4-H Youth Development Agent, Rockingham County; appointed 1954.

Leighton, Roger S., B.S.
Program Leader Forestry and CFM Supervisor; appointed 1952.

Lord, Carleton R., B.S., M.S.
4-H Youth Development Agent, Carroll County; appointed 1970.

Lord, William G., B.S., M.S.
Agricultural Agent, Sullivan County; appointed 1973.

Lovering, Edith L., B.E.
Extension Home Economist, Rockingham County; appointed 1971.

Marple, Sylvia H., B.S., M.S.
Extension Nutrition Specialist; appointed 1964.

Marriott, Bruce A., B.S., M.S.
Agricultural Agent, Belknap County; appointed 1973.

Marty, Mamie, B.S., M.S.
Extension Home Economist, Strafford County; appointed 1964-68, 1968.

McGee, Bonnie D., B.S., M.S., M.E.
Program Leader Home Economics; appointed 1972.

McGuire, Lena F., B.E.
Extension Home Economist, Belknap County; appointed 1971.

McLaughlin, Winnifred D., B.S.
Extension Agent, Nutrition Education; appointed 1972.

Nickerson, D. Anne, Cert. B.Arch.
Extension Housing Specialist; appointed 1963.

Nissen, Harriet J., B.S., M.Ed.
Extension Home Economist, Hillsborough County; appointed 1956.

Patmos, Ray M., Jr., B.S.
County Forester, Coos County; appointed 1972.

Piwowar, John S., B.S., M.S.
Assistant Extension Dairyman; appointed 1972.

Pohl, Peter W., B.S.
Forester, Carroll County; appointed 1969.

Porter, John C., B.S., M.S.
Extension Dairy Area Agent; Belknap, Carroll, Merrimack, and Sullivan counties; appointed 1974.

Pratt, Leighton C., B.S., M.S.
Agricultural Agent, Coos County; appointed 1969.

Roberts, Jeannette M., B.S., M.Ed.
Program Specialist, 4-H; appointed 1974.

Robie, Dwight A., B.S.
4-H Youth Development Agent, Merrimack County; appointed 1971.

Rogers, Glenn F., B.S., M.S.
Agricultural Agent, Grafton County; appointed 1975.

Sargent, Dennis S., B.S.
Safety Program Assistant, 4-H Youth Development; appointed 1975.

Sargent, Leslie B., Jr., B.S.
Forester, Grafton County; appointed 1954.

Schroeder, Calvin E., B.S.
4-H Youth Development Agent, Strafford County; appointed 1969.

Scott, Donald H., B.S., M.S.
Forester, Belknap County; appointed 1969.

Seavey, David C., A.A.S., B.S., M.S.
Agricultural Agent, Merrimack County; appointed 1970.

Sorensen, David C., B.S., M.S.
Agricultural Agent, Carroll County; appointed 1969.

Springer, Donn E., B.A.
Community Development Area Agent, Belknap, Carroll, Coos, and Grafton Counties; appointed 1975.

Stewart, Edwina P., B.S.
Extension Home Economist, Grafton County; appointed 1965.

Stimson, Ruth G., B.S., M.Ed.
Extension Home Economist, Rockingham County; appointed 1942.

Stocking, Marion I., B.S., M.A.
Extension Home Economist, Carroll County; appointed 1958.

Szymujko, Joseph A., B.S.
Forester, Sullivan County; appointed 1957.

Tenney, Judy L., A.S., B.S.
4-H Youth Development Agent, Grafton County; appointed 1974.

Upham, Edward F., B.S., M.S.
Agricultural Agent, Rockingham County; appointed 1960.

Vashaw, Lois J., B.E.
Extension Home Economist, Coos County; appointed 1972.

Walker, Melissa, B.S.
Program Specialist, 4-H; appointed 1973.

Weldon, Richard N., B.S., M.S.
Specialist, Agricultural Management; appointed 1975.

Williams, Charles H., B.S., M.S.
Extension Area Agent, Ornaments; appointed 1969.

Wilson, Joseph R., B.A., M.Ed.
4-H Youth Development Agent, Coos County; appointed 1975.

Wood, Dorothy A., B.S.
Extension Home Economist, Hillsborough County; appointed 1971.

Wood, Stephen A., B.S.
Assistant Forester, Sullivan County; appointed 1974.

Wyman, Christine C., B.S.
4-H Youth Development Agent, Strafford County; appointed 1963.

Administrative Divisions

Academic Affairs
David W. Ellis, Vice Provost

Academic Computing Activities
Jerry A. Warren, Director

Admissions
Eugene A. Savage, Director

Affirmative Action
Nancy H. Deane, Director

Alumni Relations
Carmen Ragonese, Director

Auxiliary Enterprises
Montgomery Childs, Director

Bookstore
Robert B. Stevenson, Manager

Budget and Administration
Allan B. Prince, Vice Provost

Business Administrator
Thomas L. Harvey

Center for Education Field Services
Jason E. Boynton, Director

Center for Emergency Planning and Operations
E. Warren Clarke, Coordinator

Center for Industrial and Institutional Development
Donald A. Moore, Director

Chaplains
Rev. William Head, Campus Minister
Rev. Edward W. Meury, Rev. Charles N. Gross, Protestant, Durham Community Church
Rev. Leon P. Gaulin and Rev. Joseph Desmond, Catholic Chaplains, Pastor St. Thomas More, Roman Catholic Church
Rev. Albert W. Snow, Rector, St. George's Episcopal Church

Computation Services
William Vasiliou, Director

Continuing Education, Division of
Edward J. Durnall, Director

Cooperative Extension Service
Maynard C. Heckel, Director

Counseling and Health Services
Peter Cimbolic, Director

Dean of Students Office
Jane E. Newman, Dean

Development Office
Robert W. Leberman, Director

Engineering Design and Analysis Laboratory
Godfrey H. Savage, Director

Engineering & Physical Sciences, College of
Richard S. Davis, Dean

Facilities Planning
R. Kimball Sprague, Jr., Facility Planner

Financial Aid
Richard H. Craig, Director

Graduate School
Raymond L. Erickson, Dean

Health Studies, School of
Basil J.F. Mott, Dean

In-Service Training
Beverly A. Parker, Coordinator

Intercollegiate Athletics
Andrew T. Mooradian, Director

Institutional Research
James A. Smith, Director

Jackson Estuarine Laboratory
Arthur C. Mathieson, Director

Liberal Arts, College of
Allan A. Spitz, Dean

Library
Donald E. Vincent, Librarian

Life Sciences and Agriculture, College of
Harry A. Keener, Dean

Marine Program
Robert W. Corell, Director

Media Services
John D. Bardwell, Director

Merrimack Valley Branch
Roger S. Bernard, Dean

New England Center for Continuing Education
Harry P. Day, Director
Arthur S. Adams, Consultant

Ombudsman
Karen Hogarth

Personnel Office
Frederic E. Arnold, Director

President's Office
Eugene S. Mills, President

Physical Plant Operation and Maintenance
Eugene H. Leaver, Director

Public Administration Service
Lawrence W. O'Connell, Director

Public Television (WENH-TV)
Keith J. Nighbert, Manager

Publications
Emily K. Smith, Director

Public Safety
David A. Flanders, Director

Radiation Safety Office
William Dotchin, Radiation Safety Officer

Recreation and Student Activities
Michael O'Neil, Director

Registration and Records
Leslie C. Turner, Registrar

Research Administration
Raymond L. Erickson, Director

Reserve Officers Training Corps
Col. John. J. Harrington, Professor of Aerospace Studies
Lt. Col. Wilfred W. West, Professor of Military Science

Residential Life
David Bianco, Director

Resources Development Center
William F. Henry, Chairperson

Space Science Center
Roger L. Arnoldy, Director

Student Affairs
Richard F. Stevens, Vice Provost

Summer Session
Edward J. Durnall, Director

Thompson School of Applied Science
Lewis Roberts, Jr., Director

University Relations
Peter Hollister, Director
L. Franklin Heald, University Editor

Water Resources Research Center
Gordon L. Byers, Director

Whittemore School of Business and Economics
Jan E. Clee, Dean

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Enrollment Statistics—Fall Semester—Durham Campus Only

	1972-1973	1973-1974	1974-1975	1975-1976	1972-1973	1973-1974	1974-1975	1975-1976	1972-1973	1973-1974	1974-1975	1975-1976
Baccalaureate Curricula	Life Sciences and Agriculture				Liberal Arts				Engineering & Physical Sciences			
Senior	246	365	365	435	971	841	829	778	152	254	203	219
Junior	324	364	434	420	1069	993	936	828	171	180	202	273
Sophomore	329	440	367	417	1244	1140	929	922	148	223	311	311
Freshman	402	347	373	382	1145	941	1058	1010	213	334	363	450
Total	1301	1516	1539	1654	4429	3915	3752	3538	648	991	1079	1253
Baccalaureate Curricula	Whittemore School				Health Studies							
Senior	201	249	247	315	151	230	181	182				
Junior	251	260	304	355	186	178	194	204				
Sophomore	243	262	301	309	170	198	197	237				
Freshman	223	254	276	268	205	200	249	256				
Total	918	1025	1128	1247	712	806	821	879				
Graduate Curricula*	Graduate School											
Master's	575	604	656	737								
Doctorates	217	236	217	191								
Unclassified	154	134	—	—								
Total	946	974	873	928								
Associate Degree Curricula*	Thompson School				Division of Continuing Education							
2nd Year	146	175	205	222								
1st Year	196	215	223	300								
Total	342	390	428	522			257	276				

*Graduate Curricula and Associate Degree Curricula should not be confused with any particular "college" column, they are separate entries.

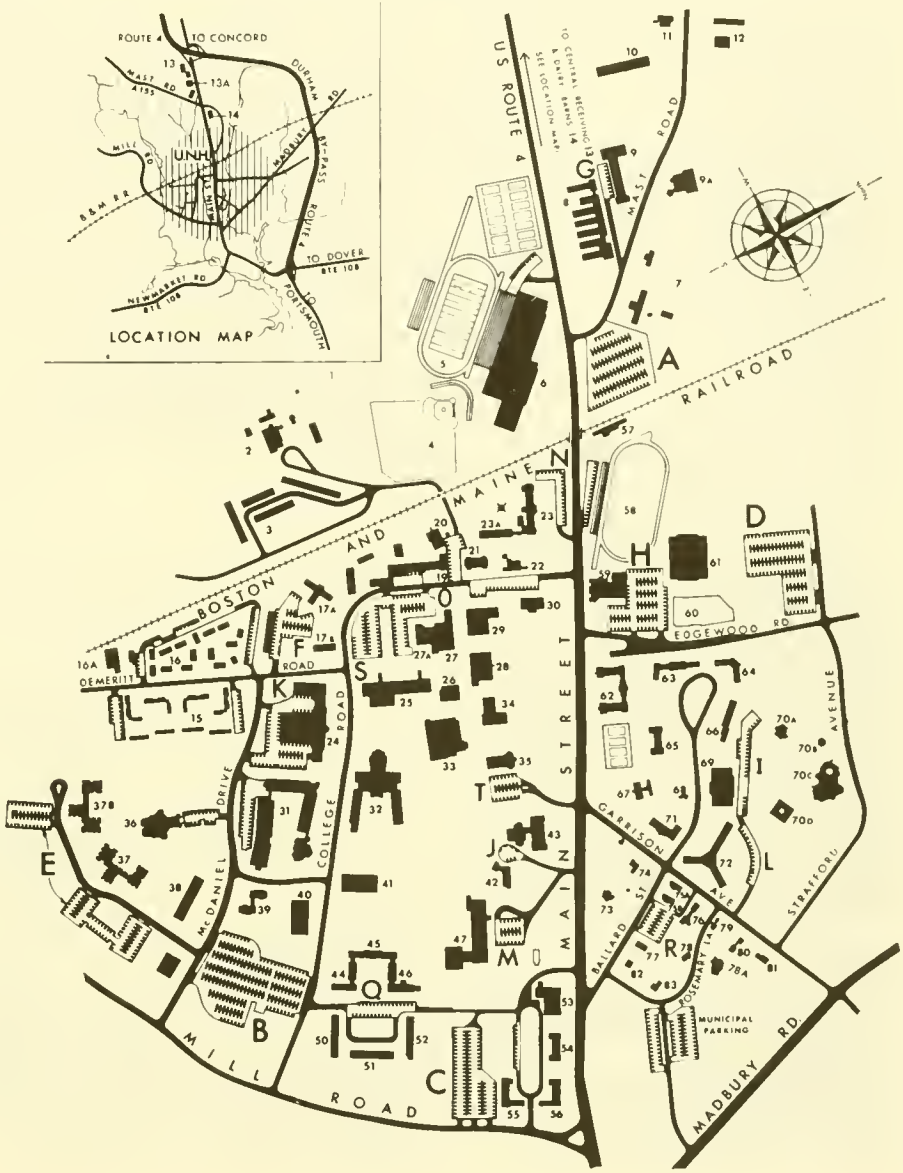
Enrollment Statistics—Fall Semester—Durham Campus Only

	Men				Women				Total			
	1972-1973	1973-1974	1974-1975	1975-1976	1972-1973	1973-1974	1974-1975	1975-1976	1972-1973	1973-1974	1974-1975	1975-1976
Freshmen	1149	1134	1161	1209	1039	942	1158	1157	2188	2076	2319	2366
Sophomores	1135	1204	1138	1108	999	1059	967	1088	2134	2263	2105	2196
Juniors	1068	1007	1064	1105	933	968	1006	975	2001	1975	2070	2080
Seniors	950	1041	974	1027	771	898	851	902	1721	1939	1825	1929
1st Year—T.S.A.S.	166	167	168	203	30	48	55	97	196	215	223	300
2nd Year—T.S.A.S.	122	135	156	162	24	40	49	60	146	175	205	222
D.C.E.—A.A.			97	96			160	180			257	276
Graduates—Master's	399	409	421	484	176	195	235	253	575	604	656	737
Graduates—Doctorates	168	191	173	146	49	45	44	45	217	236	217	191
Graduates—Unclassified	90	79	*	*	64	55	*	*	154	134	*	*
Special	43	54	*	*	53	47	*	*	96	101	*	*
Totals	5290	5421	5352	5540	4138	4297	4525	4757	9428	9718	9877	10297
Extension Credit Courses	806	760	800	765	687	755	700	800	1493	1515	1500	1565
Summer Session†	1972	1973	1974	1975	1972	1973	1974	1975	1972	1973	1974	1975
	1271	1508	1348	1421	1388	1732	1608	1677	2659	3240	2956	3098

*Included in Extension credit courses 1974 and 1975.
†Does not include Institutes and Special Summer Session in Technology

Campus Map and Key

Adams Residential Tower (N.E. Center)	70a
Admissions Office	35
Agricultural Experiment Station	22
Agronomy Field Station	11
Alexander Hall	55
Alumni House	74
Analytical Services Laboratory	23
Babcock House	39
Barton Hall	9a
Batcheller House	78
Bookstore	27a
Brackett Field	4
Brook House	79
Business Office	35
Center for Educational Field Services	30
Center for Industrial and Institutional Development	40
Christensen Hall	37
College Woods	1
Computation Center	24
Conant Hall	26
Conferences	77
Congreve Hall	62
Continuing Education, Division of	75a
Cooperative Extension Service	22
Counseling and Testing	76
Dairy Bar	57
Dairy Barns (location map)	14
Dean of Students	53
DeMerritt Hall	28
Devine Hall	46
Dimond Library	33
Elizabeth DeMeritt House	81
Engineering Design & Analysis Lab	24
Engineering & Physical Sciences, College of	24
Englehardt Hall	52
Fairchild Hall	54
Farm Service Building	12
Field House	6
Financial Aid	35
Fire Station & Service Building	19
Forest Park Apartments	15, 16
Gibbs Hall	50
Graduate School	41
Greenhouses	8
Hamilton Smith Hall	43
Health Studies, School of	27
Hennessy Theater	32
Hersey House	75b
Hetzel Hall	56
Hewitt Hall	27
Hitchcock Hall	44
Hood House Infirmary	42
Horse Barn	10
Hubbard Hall	38
Huddleston Hall	53
Hunter Hall	51
International House	80
International Students' Adviser	53
James Hall	29
Janetos House	83
Jessie Doe Hall	66
Johnson Theater	32
Kendall Hall	23a
Kingsbury Hall	24
Lewis Fields	5
Liberal Arts, College of	34
Library	33
Life Sciences & Agriculture, College of	22
Lord Hall	64
McConnel Hall	40
McLaughlin Hall	63
Media Services	33
Memorial Union Building	47
Mini Dorms	37c
Morrill Hall	30
Murkland Hall	34
Natural & Environmental Resources, Institute of	29
Nesmith Hall	23
New England Center for Continuing Education	70
New Hampshire Hall	59
Nursery School	68
O'Connell House	84
Ombudsman	43
Palmer House	78a
Parsons Hall	31
Paul Creative Arts Center	32
Pettee Hall	21
Philbrook Dining Hall	36
Poultry Plant	3
President's Office	35
Public Administration Service	41
Putnam Hall	9
Randall Hall	45
Registrar, Registration & Records	35
Residence Office (Housing)	72
Resources Development Center	82
Rice House	83a
Richards House	77
Ritzman Nutrition Laboratory	2
Robinson House	78b
Safety Services	19
Sawyer House	71
Schofield House	76
SCORE Building	17b
Scott Hall	65
Sculpture Laboratory	17a
Security	19
Smith Hall	67
Snively Arena	61
Social Science Center	41
Space Science Center	28
Spaulding Life Science Building	25
Stillings Dining Hall	69
Stoke Hall	72
Swimming Pool	60
Taylor Hall	22
Thompson Hall	35
Thompson School of Applied Science	9a
Tickets, Athletic	6
Tickets, Cultural Events	47
Trio Programs	78b
Verrette House	75a
Water Resources Research Center	21
Williamson Hall	37a
WENH-TV	47
Whittemore School (McConnell Hall)	40
Wolff House	82


LOCATION MAP
ROUTE 4
TO CONCORD
MAST RD
A155
DURHAM RD
MILL RD
B&M RR
UNH
MADBURY
BY-PASS ROUTE 4
TO DOVER
RTE 108
NEWMARKET RD
RTE 108
PORTSMOUTH
US ROUTE 4
TO CENTRAL RECEIVING & DAIRY BARNS 14
SEE LOCATION MAP
MAST ROAD
RAILROAD
BOSTON AND MAINE
DEMERITT ROAD
COLLEGE ROAD
McDANIEL DRIVE
MAIN STREET
EDGEWOOD RD
GARRISON AVE
BALLARD ST
ROSEMARY LA
STRAFFORD AVENUE
MUNICIPAL PARKING
MILL ROAD
MADBURY RD.
A
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The University does not guarantee employment to its graduates, but their chances for employment are enhanced if they have begun career planning early in their undergraduate days. The University provides a career planning and placement service that is available to all students.

The University is in compliance with federal guaranteed student loan regulations and does supply information about the employment of its graduates who have majored in specialized degree programs, which normally lead to specific employment fields. This information is available upon request from the University's Career Planning and Placement Service.

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